2248

MODEL MUNICIPAL NOISE CONTROL BY-LAW

Final Report

August, 1978

Ontario
Environment
Environnement

NPC-100

MODEL MUNICIPAL NOISE CONTROL BY-LAW

Final Report

August, 1978

Information regarding contents and implementation of this document may be obtained from:

Supervisor
Noise Pollution Control Section
Environment Ontario
135 St. Clair Ave. West
Toronto, Canada
M4V 1P5

This document may be obtained from:

Ontario Government Bookstore
880 Bay Street
Toronto, Canada
M7A 1N8

All technical publications related to the Model Municipal Noise Control By-Law issued prior to the date of this publication are no longer valid

KEY WORDS:

ACOUSTICS, AIRCRAFT, BIRD SCARERS, BLASTING, BY-LAW, DECIBEL, ENVIRONMENT, GUNSHOTS, IMPULSE, LAND-USE, LEGISLATION, NOISE, PEST CONTROL, PITCH, PLANNING, REGULATION, SOUND, TRAFFIC, TRAINS, TONE, STANDARD, VIBRATION.

CONTENTS

General Introduction 5

The Environmental Protection Act, 1971 7

Noise Control By-Law - Subjective Approach - Part I

Introduction to Part I 11

By-Law To Control Noise 13

Noise Control By-Law - Comprehensive Approach - Part II 23.

Introduction to Part II 25

Assembly of a Municipal Noise By-Law 26

Required Format 27

General Philosophy and Issues 29

1. Qualitative or Subjective Approach 29

2. Quantitative Approach 29

3. Stationary Noise Source Control 31

4. Truck Noise Control 31

5. Guidelines 32

By-Law to Control Noise 35

1. Interpretation and Zones 37

2. General Prohibitions 40

3. Prohibitions by Time and Place 41

4. General Limitations on Sound Levels 43

5. Limitations on Specific Sources 43

(1) Residential Air Conditioners 43

(2) Blasting Operations 43

6. Preemption 43

7. Sound Emission Standards 44

(1) Construction Equipment - Residential Areas 44

(2) Construction Equipment - Quiet Zones 44

(3) Domestic Outdoor Power Tools 45

(4) Air Conditioners 45

(5) Motorized Conveyances 45

CONTENTS (Continued)

8. Exemption - Public Safety 46

9. Grant of Exemption by Council 46

10. Exemption of Traditional Activities 47

11. Severability 48

12. Penalty 48

Approval by the Minister of the Environment 48

Schedule I - Index of Publications 49

Publication NPC-101 - Technical Definitions 51

Publication NPC-102 - Instrumentation 57

General Purpose Sound Level Meter 58

Impulse Sound Level Meter 58

Peak Pressure Level Detector 59

Type B Integrating Sound Level Meter 59

Type A Integrating Sound Level Meter 62

Vibration Velocity Detector 63

Acoustic Calibrator 64

Publication NPC-103 - Procedures 67

Steady or Impulsive Sound 68

Varying Sound 73

Sound and Vibration from Blasting 78

Powered Mobile Construction Equipment 82

Pneumatic Equipment 82

Small Engines 82

Trucks with Governed Diesel Engines 82

Publication NPC-104 - Sound Level Adjustments 85

Publication NPC-105 - Stationary Sources 87

Sound Level Limits 87

Exclusion of Levels Below 40 dBA 88

Publication NPC-106 - Sound Levels of Road Traffic 89

Road Traffic Noise Derivation 89

Estimation of Sound Level Based on Traffic 90

Adding and Subtracting Sound Levels 92

Minimum Values of Hourly Equivalent Sound Level 92

Sound Levels According to Traffic Conditions 93

Effective Source Height 100

CONTENTS (Continued)

Publication NPC-115 - Construction Equipment 101

Excavation Equipment, Dozers, Backhoes, etc. 101

Pneumatic Pavement Breakers 102

Portable Air Compressors 102

Tracked Drills 103

Publication NPC-116 - Residential Air Conditioners 105

Sound Level Limits 105

Sound Emission Standards 106

Publications NPC-117 - Domestic Outdoor Power Tools 107

Walk-Behind Powered Lawn Mowers 107

Publication NPC-118 - Motorized Conveyances 109

Heavy Vehicles with Governed Diesel Engines 109

Heavy Vehicles with Gasoline Engines 109

Publication NPC-119 - Blasting 111

Publication NPC-131 - Guidelines for Noise Control in Land-Use Planning 113

Publication NPC-132 - Guidelines for Noise Control in Rural Areas 117

Publication NPC-133 - Guidelines on Information Required For the Assessment of Planned Stationary Sources of Sound 119

Publication NPC-134 - Guidelines on Information Required for the Assessment of Planned New Land Uses With Respect to Sound and Vibration Impacts 125

Publication NPC-135 - Certificate 129

APPENDIX - List of Publications - Environmental Acoustics 131

[illegible]

In 1971, when sound and vibration were defined [illegible] The Environmental Protection Act, 1971, the Ministry of the Environment initiated studies of environmental noise and noise control. It was generally recognized that the federal, provincial and municipal governments would each have a role to play in an effective noise control program. During the past years, this Ministry has been intensively studying the noise control programs of other governments, the sources and characteristics of noise which give rise to complaints, methods of abating noise, variations of noise levels in various community settings and associated technical aspects of noise and noise measurements.

While there was an apparent desire on the part of many municipalities in Ontario to adopt noise control by-laws to meet municipal needs, the authority under The Ontario Municipal Act for such by-laws was too narrow to permit adequate scope. It was evident that many of the common sounds and vibrations giving rise to noise complaints were of a local community nature and could be effectively controlled at the municipal level. Accordingly, in 1974, the Minister of the Environment announced that he would provide municipalities with a model noise control by-law and with adequate permissive legislative authority under The Environmental Protection Act to adopt such a by-law. The necessary amendment to The Environmental Protection Act was passed by the Legislature and came into force by proclamation of the Lieutenant Governor on October 8, 1975.

This amendment permits the councils of local municipalities, that is, cities, towns, villages, and townships, to pass noise control by-laws for the protection and conservation of the natural environment subject to the approval of the Minister of the Environment.

This document presents a model municipal noise control by-law in two formats. The Model Municipal Noise Control By-Law, Part I, is a simple qualitative (subjective) by-law likely to be suitable for smaller municipalities with less complex noise problems. The Model Municipal Noise Control By-Law, Part II, is a comprehensive by-law with both qualitative and quantitative portions from which a municipality may select suitable sections according to its needs. This latter format is presented as a by-law proper accompanied by a number of supporting technical publications.

The May 1976 revision of the Model Municipal Noise Control By-Law has been adopted by the Canadian Standards Association as a "seed" document for the development of future national standards. It is hoped that this Final Report will further assist in the carrying out of this task.

As appropriate CSA standards are developed, they may be used to replace the technical publications which support the Model Municipal Noise Control By-Law.

The Environmental Protection Act, 1971

Interpretation

1. (1) In this Act

(a) "contaminant" means any solid, liquid, gas, odour, heat, sound, vibration, radiation or combination of any of them resulting, directly or indirectly, from the activities of man which may

(i) impair the quality of the natural environment for any use that can be made of it,

(ii) cause injury or damage to property or to plant or animal life,

(iii) cause harm or material discomfort to any person,

(iv) adversely affect the health or impair the safety of any person, or

(v) render any property or plant or animal life unfit for use by man,

Municipal by-laws

95*a*.—(1) The councils of local municipalities may, subject to the approval of the Minister, pass by-laws,

(a) regulating or prohibiting the emission of sounds or vibrations;

(b) providing for the licensing of persons, equipment and premises, or any of them, with respect to the emission of sounds or vibrations;

(c) prescribing maximum permissible levels of sounds or vibrations that may be emitted;

(d) prescribing procedures for determining the levels of sounds or vibrations that are emitted,

and such a by-law may make different provisions for different areas of a local municipality and may make provision for exempting any person, equipment or premises from any provision of the by-law for such period of time and subject to such terms and conditions as may be set out or provided for in the by-law.

Adoption of codes in by-laws

(2) A by-law passed by the council of a local municipality pursuant to subsection 1 may adopt by reference, in whole or in part, with such changes as the council considers necessary, any code, formula, standard or procedure, and may require compliance with any code, standard or procedure so adopted.

Application of R.S.O. 1970, c. 284

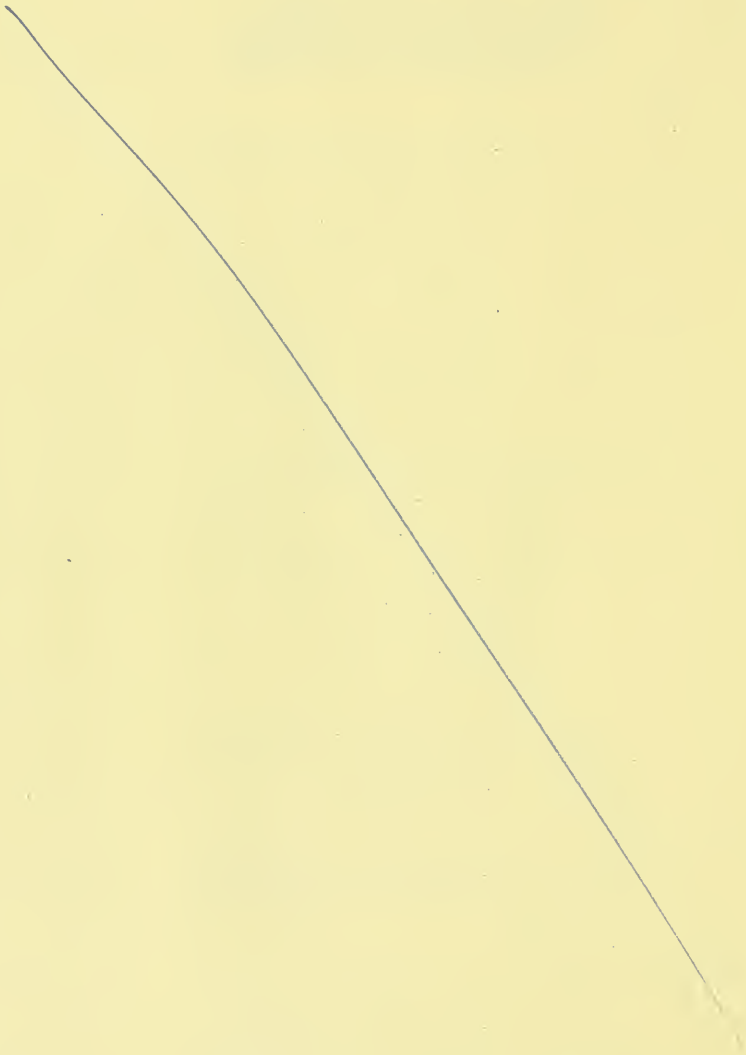
(3) Part XXI of *The Municipal Act* applies to by-laws passed under this section. 1974, c. 125, s. 3.

Conflict

96.—(1) Where a conflict appears between any provision of this Act or the regulations and any other Act or regulation in a matter related to the natural environment or a matter specifically dealt with in this Act or the regulations, the provision of this Act or the regulations shall prevail. 1971, c. 86, s. 96.

Idem

(2) Subsection 1 does not apply in respect of section 95*a* and the enactment of section 95*a* or a by-law pursuant to section 95*a* does not affect the validity of an Act that is in force immediately before the coming into force of section 95*a*. 1974, c. 125, s. 4.



MODEL MUNICIPAL NOISE CONTROL BY-LAW

PART I: SUBJECTIVE APPROACH

IMPLEMENTATION OF THIS SUBJECTIVE (OR QUALITATIVE) NOISE CONTROL BY-LAW REQUIRES NO SPECIAL FUNDING OR TRAINING OF ENFORCEMENT STAFF.

INTRODUCTION TO PART I

This is Part I of the Final Report on the Model Municipal Noise Control By-Law first issued in March, 1975 and revised in May, 1976. Part I presents a subjective or qualitative approach to noise control in the community. The by-law is simple and explicit. It is easy to implement and enforce, requiring no special funding or prior training of enforcement staff.

For the Model By-Law, the Ministry will provide on request sets of by-law master forms that may be immediately used in preparing a suitable noise control by-law. Insertion of appropriate information at the places indicated would prepare the noise control by-law for consideration by Council. For example, different levels of noise control are provided depending on whether an area of the municipality is designated as a "Residential Area" or a "Quiet Zone". "Residential Area" is reasonably self-explanatory. A "Quiet Zone" is an area, such as the site of a hospital, where quiet is of particular importance. In subsection 2 of section 1 of the by-law, designations of such different areas of the municipality must be inserted.

Flexibility is provided in Section 3 of the by-law with regard to local preferences as to times when noise making is prohibited. Similarly, this section may be expanded or diminished to provide for local needs. If major changes are contemplated to Section 3, the Ministry should be consulted before placing the by-law before Council.

After adoption by Council, three certified copies of the by-law should be forwarded to the Minister of the Environment for his approval as required by the legislation.

Municipalities experiencing severe noise problems may find that the subjective approach to local noise control is not entirely adequate. In that case, reference should be made to Part II of the Final Report. Part II provides a comprehensive model by-law incorporating both qualitative (subjective) and quantitative noise controls. The comprehensive by-law may be adopted in part or in whole according to local need, or quantitative provisions added to an existing qualitative by-law.

Guidance on preparing a by-law may be obtained from the Supervisor, Noise Pollution Control Section, Pollution Control Branch, Toronto, (416) 965-1193.

A BY-LAW TO CONTROL NOISE

By-Law No. _____

A By-Law of the Corporation of

WHEREAS it is expedient to exercise the power conferred upon the Council by The Environmental Protection Act, 1971, as amended, and other statutory authority; and

WHEREAS a recognized body of scientific and technological knowledge exists by which sound and vibration may be substantially reduced; and

WHEREAS the people have a right to and should be ensured an environment free from unusual, unnecessary, or excessive sound or vibration which may degrade the quality and tranquillity of their life or cause nuisance; and

WHEREAS it is the policy of the Council to reduce and control such sound or vibration;

NOW THEREFORE, the Council of the Corporation of
enacts as follows:

1. Interpretation

(1) In this by-law,

(a) Construction

"construction" includes erection, alteration, repair, dismantling, demolition, structural maintenance, painting, moving, land clearing, earth moving, grading, excavating, the laying of pipe and conduit whether above or below ground level, street and highway building, concreting, equipment installation and alteration and the structural installation of construction components and materials in any form or for any purpose, and includes any work in connection therewith;

(b) Construction Equipment

"construction equipment" means any equipment or device designed and intended for use in construction, or material handling, including but not limited to, air compressors, pile drivers, pneumatic or hydraulic tools, bulldozers; tractors, excavators, trenchers, cranes, derricks, loaders, scrapers, pavers, generators, off-highway haulers or trucks, ditchers, compactors and rollers, pumps, concrete mixers, graders, or other material handling equipment;

(c) Conveyance

"conveyance" includes a vehicle and any other device employed to transport a person or persons or goods from place to place but does not include any such device or vehicle if operated only within the premises of a person;

(d) Council

"Council" means the Council of the Corporation of (state full legal name of municipality)_____;

(e) Highway

"highway" includes a common and public highway, street, avenue, parkway, driveway, square, place, bridge, viaduct or trestle designed and intended for, or used by, the general public for the passage of vehicles;

(f) Minister

"Minister" means Minister of the Environment;

(g) Ministry

"Ministry" means Ministry of the Environment;

(h) Motor Vehicle

"motor vehicle" includes an automobile, motorcycle, and any other vehicle propelled or driven otherwise than by muscular power; but does not include the cars of electric or steam railways, or other motor vehicles running only upon rails, or a motorized snow vehicle, traction engine, farm tractor, self-propelled implement of husbandry or road-building machine within the meaning of The Highway Traffic Act;

(i) Motorized Conveyance

"motorized conveyance" means a conveyance propelled or driven otherwise than by muscular, gravitational or wind power;

(j) Municipality

"municipality" means the land within the geographic limit of (state full legal name of municipality)_____;

(k) Noise

"noise" means unwanted sound;

(l) Point of Reception

"point of reception" means any point on the premises of a person where sound or vibration originating from other than those premises is received.

(2) Zones

In this by-law,

(a) Residential Area

"Residential Area" means those areas of the municipality specified as follows:

(b) Quiet Zone

"Quiet Zone" means those areas of the municipality specified as follows:

(c) Agricultural Area

"Agricultural Area" means those areas of the municipality specified as follows:

2. General Prohibitions

No person shall emit or cause or permit the emission of sound resulting from an act listed herein, and which sound is clearly audible at a point of reception:

1. Racing of any motorized conveyance other than in a racing event regulated by law.
2. The operation of a motor vehicle in such a way that the tires squeal.
3. The operation of any combustion engine or pneumatic device without an effective exhaust or intake muffling device in good working order and in constant operation.
4. The operation of a vehicle or a vehicle with a trailer resulting in banging, clanking, squealing or other like sounds due to improperly secured load or equipment, or inadequate maintenance.
5. The operation of an engine or motor in, or on, any motor vehicle or item of attached auxiliary equipment for a continuous period exceeding five minutes, while such vehicle is stationary in a Residential Area or a Quiet Zone unless:
   - (i) the original equipment manufacturer specifically recommends a longer idling period for normal and efficient operation of the motor vehicle in which case such recommended period shall not be exceeded; or,
   - (ii) operation of such engine or motor is essential to a basic function of the vehicle or equipment, including but not limited to, operation of ready-mixed concrete trucks, lift platforms and refuse compactors; or,
   - (iii) weather conditions justify the use of heating or refrigerating systems powered by the motor or engine for the safety and welfare of the operator, passengers or animals, or the preservation of perishable cargo, and the vehicle is stationary for purposes of delivery or loading; or,
   - (iv) prevailing low temperatures make longer idling periods necessary immediately after starting the motor or engine; or,
   - (v) the idling is for the purpose of cleaning and flushing the radiator and associated circulation system for seasonal change of antifreeze, cleaning of the fuel system, carburetor or the like, when such work is performed other than for profit.
6. The operation of a motor vehicle horn or other warning device except where required or authorized by law or in accordance with good safety practices.
7. The operation of any item of construction equipment in a Quiet Zone or Residential Area without effective muffling devices in good working order and in constant operation.

3. Prohibitions by Time and Place

No person shall emit or cause or permit the emission of sound resulting from any act listed in Table 3-1 if clearly audible at a point of reception located in an area of the municipality within a prohibited time shown for such an area.

TABLE 3-1
PROHIBITIONS BY TIME AND PLACE

		Prohibited Period of Time	
		Quiet Zone	Residential Area
1.	The detonation of fireworks or explosive devices not used in construction.	At all times	At all times
2.	The discharge of firearms.	At all times	At all times
3.	The operation of a combustion engine which, (i) is, or (ii) is used in, or (iii) is intended for use in, a toy or a model or replica of any device, which model or replica has no function other than amusement and which is not a conveyance.	At all times	At all times
4.	The operation of any electronic device or group of connected electronic devices incorporating one or more loudspeakers or other electro-mechanical transducers, and intended for the production, reproduction or amplification of sound.	At all times	C
5.	The operation of any auditory signalling device, including but not limited to the ringing of bells or gongs and the blowing of horns or sirens or whistles, or the production, reproduction or amplification of any similar sounds by electronic means except where required or authorized by law or in accordance with good safety practices.	At all times	D & E
6.	The operation of any powered rail car including but not limited to refrigeration cars, locomotives or self-propelled passenger cars, while stationary on property not owned or controlled by a railway governed by the Canada Railway Act.	At all times	B
7.	The operation of any motorized conveyance other than on a highway or other place intended for its operation.	At all times	B

TABLE 3-1
PROHIBITIONS BY TIME AND PLACE

	Prohibited Period of Time	
	Quiet Zone	Residential Area
8. The venting, release or pressure relief of air, steam or other gaseous material, product or compound from any autoclave, boiler pressure vessel, pipe, valve, machine, device or system.	At all times	A
9. Persistent barking, calling or whining or other similar persistent noise making by any domestic pet or any other animal kept or used for any purpose other than agriculture.	At all times	A
10. The operation of a commercial car wash with air drying equipment.	At all times	D & E
11. Yelling, shouting, hooting, whistling or singing.	At all times	A
12. The operation of a power assisted hang glider or parafoil.	At all times	D & E
13. The operation of any item of snow making equipment.	At all times	E
14. All selling or advertising by shouting or outcry or amplified sound.	At all times	D & E
15. Loading, unloading, delivering, packing, unpacking, or otherwise handling any containers, products, materials, or refuse, whatsoever, unless necessary for the maintenance of essential services or the moving of private household effects.	D & E	D & E
16. The operation of any equipment in connection with construction.	D & E	D & E
17. The operation or use of any tool for domestic purposes other than snow removal.	C	B
18. The operation of solid waste bulk lift or refuse compacting equipment.	C	B
19. The operation of a commercial car wash of a type other than mentioned in item 10.	C	A

Prohibited Periods of Time:

A - 23 00 one day to 07 00 next day (09 00 Sundays)
B - 19 00 one day to 07 00 next day (09 00 Sundays)
C - 17 00 one day to 07 00 next day (09 00 Sundays)
D - All day Sundays and Statutory Holidays.
E - 19 00 one day to 07 00 next day.

4. Exemption

Public Safety

Notwithstanding any other provision of this by-law, it shall be lawful to emit or cause or permit the emission of sound or vibration in connection with emergency measures undertaken:

(a) for the immediate health, safety or welfare of the inhabitants or any of them; or,

(b) for the preservation or restoration of property;

unless such sound or vibration is clearly of a longer duration or nature more disturbing, than is reasonably necessary for the accomplishment of such emergency purpose.

5. Grant of Exemption by Council

(1) Application to Council

Notwithstanding anything contained in this by-law, any person may make application to Council to be granted an exemption from any of the provisions of this by-law with respect to any source of sound or vibration for which he might be prosecuted and Council, by resolution, may refuse to grant any exemption or may grant the exemption applied for or any exemption of lesser effect and any exemption granted shall specify the time period, not in excess of six months, during which it is effective and may contain such terms and conditions as Council sees fit.

(2) Decision

In deciding whether to grant the exemption, Council shall give the applicant and any person opposed to the application an opportunity to be heard and may consider such other matters as it sees fit.

(3) Breach

Breach by the applicant of any of the terms or conditions of any exemption granted by Council shall render the exemption null and void.

6. Exemption of Traditional, Festive or Religious Activities

Notwithstanding any other provision of this by-law, this by-law does not apply to a person who emits or causes or permits the emission of sound or vibration in connection with any of the listed traditional, festive, religious and other activities:

7. Severability

If a court of competent jurisdiction should declare any section or part of a section of this by-law to be invalid, such section or part of a section shall not be construed as having persuaded or influenced Council to pass the remainder of the by-law and it is hereby declared that the remainder of the by-law shall be valid and shall remain in force.

8. Penalty

Every person who contravenes any of the provisions of this by-law is guilty of an offence and shall, upon conviction thereof, forfeit and pay a penalty of not more than $1,000.00 for a first offence and not less than $100.00 and not more than $1,000.00 for a second or subsequent offence, exclusive of costs and every such fine is recoverable under The Summary Convictions Act.

READ A FIRST AND SECOND TIME THIS day of 19 .

READ A THIRD TIME AND FINALLY PASSED THIS day of 19 .

_____ _____

MAYOR CLERK

I hereby certify the foregoing to be a complete and true copy of By-law Number

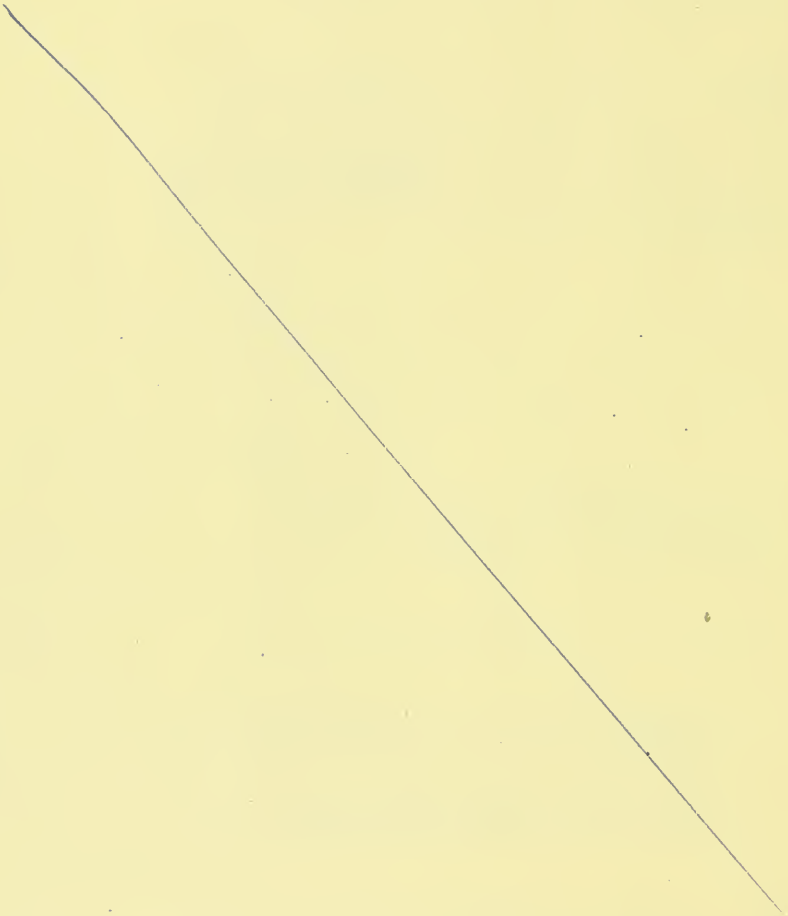
_____

CLERK

This By-law is approved pursuant to the provisions of The Environmental Protection Act, 1971, as amended, at Toronto, this day of 19 .

_____

MINISTER OF THE ENVIRONMENT



MODEL MUNICIPAL NOISE CONTROL BY-LAW

PART II: COMPREHENSIVE APPROACH

This is Part II of the Final Report on the Model Municipal Noise Control By-Law. Part II describes the comprenensive by-law format. It is complete except for two deliberate omissions referred to later in the text. The May 1976 document has been recast to make it more accessible for reference and to make it more understandable to the user. All the supporting technical publications (NPC Publications) have been renumbered to provide an orderly sequence and more cross references have been added. The technical publications are now complete as far as was planned in the 1974 policy statement. Municipalities now have adequate legislative capability to achieve their objective for community noise control.

The new noise control features in Part II of the Final Report are:

- Equivalent sound levels below 40 dBA are excluded from the by-law;
- A measurement procedure and standard for impulsive noise;
- A measurement procedure and standard for heavy vehicles;
- A guideline for noise control in rural areas;
- A guideline for assessment of new noise sources;
- Refinement of allowable levels for blasting (both concussion and vibration) and for construction equipment;
- Refinement of road traffic noise prediction;
- Refinement of specifications for various measuring instruments.

The omissions mentioned above are found in:

- Publication NPC-116 - Residential Air Conditioners. This Publication awaits the development of a CSA standard on sound rating of consumer appliances. Adoption of this CSA standard may lead to legislation requiring sound emission labelling of consumer appliances.
- Publication NPC-118 - Motorized Conveyances. This Publication awaits the development of a CSA standard for heavy vehicles equipped with ungoverned gasoline engines.

The By-Law is now in a form that may be readily adopted, in part or in whole, by a municipal council to suit its specific noise control requirements. The Ministry of the Environment will provide assistance in formulating such a by-law. The Ministry will also provide staff training and technical back-up as necessary during the initial implementation of such a by-law.

A noise control by-law passed by Council pursuant to Section 95a of The Environmental Protection Act, 1971, requires the approval of the Minister. Every amendment or repeal of a noise control by-law passed pursuant to The Environmental Protection Act, 1971, also requires the approval of the Minister. The following describes how such a by-law may be assembled and how this approval may be obtained.

Assembly of a Municipal Noise Control By-Law

For the assistance of municipalities, a Model Municipal Noise Control By-Law has been prepared by the Ministry. Council may choose to adopt the Model By-Law in whole, or in part, so that it may best meet the particular requirements of the municipality. Three suggested formats are presented as follows:

OPTION 1 - Qualitative By-Law

This by-law, described fully in Part I of the Final Report on the Model By-Law, is a variation on sections 1 through 3 and 8 through 12 of the Model By-Law, Part II and would represent a thorough form of qualitative noise control by-law.

OPTION 2 - Qualitative and Limited Quantitative By-Law

This by-law would incorporate sections 1 through 3 and sections 8 through 12 and in addition, a selection from sections 4, 5, 6 and 7 of the Model By-Law, Part II.

OPTION 3 - Comprehensive By-Law

A by-law which includes the entire Model By-Law, Part II, will provide for comprehensive control of sound and vibration.

A municipality may, however, find different selections of parts of the Model By-Law more suitable for its purpose, and may wish to alter some of the provisions in the text of the By-Law. Alteration of the supporting technical publications, however, is not permitted; these documents represent the culmination of extensive technical research, augmented and often guided by inputs from various government agencies, research bodies and industry.

Observance of the required format may expedite approval by the Minister

Required Format

When assembling a by-law from sections of the Model By-Law, Part II, the following provisions apply:

(a) Subsection (1) of section 1 and Publication NPC-101 - Technical Definitions must be included without change if any of sections 4, 5 or 7 are included.

(b) Subsection (2) of section 1 and Schedule 1 must be included without change, except that:

(i) the definitions of "Certificate" and "Publication" may be omitted if the by-law is wholly qualitative; and

(ii) the definition of "Noise Control Officer" may be amended or altered so as to designate the Noise Control Officer by naming the office he holds within the municipal administration.

(c) Subsection (3) of section 1 must be included in the by-law. The Model suggests three noise zones which may be appropriate. "Residential Area" and "Agricultural Area" are reasonably self-explanatory. A "Quiet Zone" is an area, such as the site of a hospital, where quiet is of particular importance. It is permissible to delete any of these zones, except "Residential Area", or to specify different kinds of zones, such as Commercial or Rural Areas, if this seems advisable because of the nature of the community. Certain alterations to section 3 may be necessary depending on the specification of such noise zones. The time restrictions in Table 3-1 are suggestions only and may be revised to suit municipal requirements. The letter code shown in the Table may also be replaced by the applicable hours.

(d) The definitions of noise zones in subsection (3) of section 1 must be completed by Council in such a way as to specify the geographic boundaries of each defined zone. This may be done by reference to zoning by-laws, by using maps or by any other convenient descriptive means. If this description is lengthy, it may be desirable to put it into a separate Schedule.

(e) A selection from sections 2 through 7 must be made and no significant change in wording will be permitted.

(f) If any of sections 4, 5 or 7 are included, all of the technical publications must be attached to and form part of the by-law.

(g) Section 6 must be included if both sections 4 and 5 are selected.

(h) The by-law must include section 8 of the Model By-Law or some suitable variation.

(i) Sections 9 and 10 of the Model By-Law are optional as to inclusion and to precise wording. If section 10 is included, it must be completed.

(j) The by-law must include sections 11 and 12 of the Model By-Law or some suitable variation.

The By-Law is administered by the Noise Control Officer designated by Council. Proper enforcement of the quantitative aspects of a by-law as mentioned in options 2 and 3 above will require trained personnel in possession of a valid Certificate of Competency in Environmental Acoustics Technology.

Preparation of a noise control by-law should be undertaken in consultation with the Ministry. After adoption by Council, three certified copies of the by-law should be forwarded to the Minister of the Environment for his approval as required by the legislation.

General Philosophy and Issues

1. Qualitative or Subjective Approach

While many municipalities may wish to control noise of the nuisance type in a more efficient manner than possible under existing legislation, the problems may not be sufficiently disruptive or serious enough to warrant regular expenditures or full time assignment of staff.

For those municipalities a qualitative by-law containing the provisions of section 2 and some or all of the provisions of section 3 will usually offer adequate legal power (See Part I of the Final Report). The cost of implementation of such a qualitative by-law is small since neither specialized training nor instrumentation is required for enforcement. The enforcement of qualitative noise control measures requires only normal hearing and judgement of a "reasonable person" on the part of the enforcing officer. Audibility of sound from a particular source at the time noted and on the premises of a receptor as listed in the provisions specified in the by-law will constitute a violation. This simple definition of a violation removes the subjectivity from judgement of the allegedly annoying sound, provided the person making the judgement has normal hearing ability and is a "reasonable person". This would not exclude people with exceptionally good hearing, but it would prevent the employment of a person with hearing impairment to serve as a Noise Control Officer.

The foregoing description of a "qualitative" by-law naturally excludes the use of any "numbers" or "quantities" in defining annoying sounds.

2. Quantitative Approach

Municipalities having problems with the noise of air conditioners, construction equipment or other types of machinery, require more complex by-law provisions. The control of noise from machinery warrants the use of instruments to quantitatively describe the sound radiated by such machinery. Once the sound is described numerically, a standard or limit

for acceptability can be devised. Many years of research on the part of a large number of scientists, physicians and engineers have been spent to reach the present level of understanding and knowledge of what is "acceptable". Naturally, various individuals may have different needs and subjective opinions on what annoys them, while the tolerance level in a single individual may change from time to time. Consequently, the sound level limits set in this Model By-Law are based on the best current understanding of the needs of our population, tempered by the availability and practicability of the technology for measurement and control.

The various technical publications (NPC Publications) reflect the state of the art. They have been modified several times to accomodate the existing economic reality and to provide the simplest means of enforcement. They represent a high quality of noise control and they require specialized instruments and specialized training for enforcement.

A municipality wishing to control the noise of industry and commerce will be wise to consider first the type of noise problems that are prevalent within the municipal boundaries and then proceed to adopt the particular provisions of this Model By-Law which address those problems best. The expertise and experience accumulated by the acoustics specialists in the Ministry is available to each municipality in the form of consultations. Such consulation may prove to be a considerable assistance to Council at the formative phase of a planned by-law.

It should be understood that some of the quantitative controls may apply in situations where there are also applicable qualitative controls. Legally, this means that both requirements must be met. In some cases adjustment of the by-law might be desirable.

Enforcement of a quantitative noise by-law is complicated. The accurate measurement of sound is a complex problem particularly when attempting to satisfy legal requirements. In order to successfully prosecute a case based on a quantitative noise control by-law, it is essential that the

instrumentation and the measurement procedures used, rigorously conform to the requirements of the Noise Pollution Control Publications published by the Ministry of the Environment. It must be conclusively demonstrated to the Court that the measurements given in evidence are accurate, reliable and within the tolerances specified. The Publications represent some of the most advanced procedures and instrumentation standards in the field of environmental acoustics. These are set out in a logical and relatively simple fashion. Faithful observance of all of the provisions of the Publications will help to convince the Court of the validity of the evidence presented.

3. Stationary Noise Source Control

The control of noise from sources in industrial or commercial establishments or even in residential areas is addressed in general terms by section 4 of the Model By-Law. Section 4 refers to a technical publication, NPC-105 - Stationary Sources, as a supporting document. The problem is two-fold. Some noises are annoying, no matter where or in what kind of environment they exist. High level impulsive noises, for example are restricted by an absolute limitation. Other noises are annoying because they are heard over and above the level of the so-called "ambient" or surrounding environmental "noise climate" at a particular location. The noise emission standard is therefore expressed as the difference between noise from the source and the ambient noise. The ambient noise chosen for this purpose is essentially made up of the road traffic noise which pervades the locality and creates a so-called "urban hum". Publication NPC-106 - Sound Levels of Road Traffic, defines this ambient noise and also provides a simple method for prediction of road traffic noise in an urban community.

4. Truck Noise Control

Truck traffic is a major component of traffic noise. Reduction of truck traffic noise would bring about a direct reduction of road traffic noise and consequently of ambient noise levels. The progressive reduction of noise from new trucks is a fortunate consequence of stricter federal regulations in the United States and Canada. These regulations result in the manufacture of trucks quieter today than ever before.

However, the roads are used by all kinds of trucks and cars, new ones as well as old ones. Older trucks were built noisier than new ones and they may also be in need of maintenance or repair. The Model By-Law provides for municipal control on municipal roads of noise from trucks that are in poor repair and thereby creating noise that could be avoided.

Section 2 of the Model provides general and qualitative controls, while subsection (5) of section 7 provides quantitative measures to combat this form of noise pollution. This latter provision relies on the measures in Publication NPC-118 - Motorized Conveyances, to identify heavy trucks with engines that are in poor repair and are consequently "noisy". The method described in NPC-118 will not, however, identify all the "noisy" trucks since noisiness is subjective. The provisions in this Publication identify only those trucks that definitely do not measure up to standards of well maintained trucks.

5. Guidelines

The Model Municipal Noise Control By-Law has five guideline publications attached to it which are reference documents and do not form an essential part of a municipal by-law. The information contained in these guidelines expresses principles which govern staff of the Ministry of the Environment on the subject of noise. These guideline publications deal with land-use planning, noise control in rural areas, new noise source assessment information, new land-use assessment information and the certification of Noise Control Officers.

1. Publication NPC-131 - Guidelines for Noise Control in Land-Use Planning, has been the basis of land-use planning with respect to noise impact on new residential development. This publication was first issued in May, 1975.
2. Publication NPC-132 - Guidelines for Noise Control in Rural Areas, is an entirely new guideline. It will be used in evaluating noise pollution problems in rural areas where man-made noise sources may create nuisance in an environment that is normally dominated only by the sounds of nature.

3. Publication NPC-133 - Guidelines on Information Required for the Assessment of Planned Stationary Sources of Sound is also a new publication within the framework of the Model By-Law. This document has, heretofore, been the basis of evaluation of proposed installations for the purpose of issuance of a Certificate of Approval, in accordance with the provisions of Section 8 of The Environmental Protection Act. It will also have a place in evaluation of submissions made under the provisions of The Environmental Assessment Act.
4. Publication NPC-134 - Guidelines on Information Required for the Assessment of Planned New Land Uses With Respect to Sound and Vibration Impacts, is a new publication. This document will assist planners in the preparation of submissions in support of applications for approval of new land uses.
5. Publication NPC-135 - Certificate, is simply a renumbered version of an older document. The Publication describes the requirements for certification of Noise Control Officers.

The guidelines are included in the complete Model By-Law document to provide additional assistance to Council in the areas of planning, zoning, public works, building permits and, in general, any municipal matter where noise considerations might be relevant.

The Minister is prepared to assist all municipalities in the adoption and implementation of a by-law and particularly, to assist with the technical training of personnel in sound and vibration measurement and enforcement procedures.

6. Earlier Versions of the By-Law

Earlier versons of the Model Municipal Noise Control By-Law and the related Noise Pollution Control Publications are supplanted by publication of this Final Report.

A BY-LAW TO CONTROL NOISE

By-Law No. _____

A By-Law of the Corporation of

WHEREAS it is expedient to exercise the power conferred upon the Council by The Environmental Protection Act, 1971, as amended, and other statutory authority; and

WHEREAS a recognized body of scientific and technological knowledge exists by which sound and vibration may be substantially reduced; and

WHEREAS the people have a right to and should be ensured an environment free from unusual, unnecessary, or excessive sound or vibration which may degrade the quality and tranquillity of their life or cause nuisance; and

WHEREAS it is the policy of the Council to reduce and control such sound or vibration;

NOW THEREFORE, the Council of the Corporation of
enacts as follows:

1. Interpretation

(1) Technical Terms

In this by-law all the words which are of a technical nature and are related to sound or vibration shall have the meanings specified for them in Publication NPC-101 - Technical Definitions.

(2) Definition

In this by-law,

(a) Certificate

"Certificate" means a Certificate of Competency in Environmental Acoustics Technology of a specified class issued by the Minister of the Environment;

(b) Construction

"construction" includes erection, alteration, repair, dismantling, demolition, structural maintenance, painting, moving, land clearing, earth moving, grading, excavating, the laying of pipe and conduit whether above or below ground level, street and highway building, concreting, equipment installation and alteration and the structural installation of construction components and materials in any form or for any purpose, and includes any work in connection therewith;

(c) Construction Equipment

"construction equipment" means any equipment or device designed and intended for use in construction, or material handling, including but not limited to, air compressors, pile drivers, pneumatic or hydraulic tools, bulldozers, tractors, excavators, trenchers, cranes, derricks, loaders, scrapers, pavers, generators, off-highway haulers or trucks, ditchers, compactors and rollers, pumps, concrete mixers, graders, or other material handling equipment;

(d) Conveyance

"conveyance" includes a vehicle and any other device employed to transport a person or persons or goods from place to place but does not include any such device or vehicle if operated only within the premises of a person;

(e) Council

'Council" means the Council of the Corporation of (state full legal name of municipality)_____;

(f) Highway

"highway" includes a common and public highway, street, avenue, parkway, driveway, square, place, bridge, viaduct or trestle designed and intended for, or used by, the general public for the passage of vehicles;

(g) Minister

"Minister" means Minister of the Environment;

(h) Ministry

"Ministry" means Ministry of the Environment;

(i) Motor Vehicle

'motor vehicle' includes an automobile, motorcycle, and any other vehicle propelled or driven otherwise than by muscular power; but does not include the cars of electric or steam railways, or other motor vehicles running only upon rails, or a motorized snow vehicle, traction engine, farm tractor, self-propelled implement of husbandry or road-building machine within the meaning of The Highway Traffic Act;

(j) Motorized Conveyance

"motorized conveyance" means a conveyance propelled or driven otherwise than by muscular, gravitational or wind power;

(k) Municipality

"municipality" means the land within the geographic limit of (state full legal name of municipality)_____;

(l) Noise

"noise" means unwanted sound;

(m) Noise Control Officer

"Noise Control Officer" means a person designated by Council as responsible for the administration of this by-law;

(n) Point of Reception

'point of reception" means any point on the premises of a person where sound or vibration originating from other than those premises is received;

(o) Publication

"Publication" means a specified publication of the Noise Pollution Control Section of the Pollution Control Branch of the Ministry of the Environment, which is named in Schedule I; a copy of every Publication which is named in Schedule I is attached hereto and is hereby made part of this by-law;

(p) Stationary Source

'stationary source" means a source of sound which does not normally move from place to place and includes the premises of a person as one stationary source, unless the dominant source of sound on those premises is construction or a conveyance.

(3) Zones

In this by-law,

(a) Residential Area

"Residential Area" means those areas of the municipality specified as follows:

(b) Quiet Zone

"Quiet Zone" means those areas of the municipality specified as follows:

(c) Agricultural Area

"Agricultural Area" means those areas of the municipality specified as follows:

2. General Prohibitions

No person shall emit or cause or permit the emission of sound resulting from an act listed herein, and which sound is clearly audible at a point of reception:

1. Racing of any motorized conveyance other than in a racing event regulated by law.
2. The operation of a motor vehicle in such a way that the tires squeal.
3. The operation of any combustion engine or pneumatic device without an effective exhaust or intake muffling device in good working order and in constant operation.
4. The operation of a vehicle or a vehicle with a trailer resulting in banging, clanking, squealing or other like sounds due to improperly secured load or equipment, or inadequate maintenance.
5. The operation of an engine or motor in, or on, any motor vehicle or item of attached auxiliary equipment for a continuous period exceeding five minutes, while such vehicle is stationary in a Residential Area or a Quiet Zone unless:
   (i) the original equipment manufacturer specifically recommends a longer idling period for normal and efficient operation of the motor vehicle in which case such recommended period shall not be exceeded; or,
   (ii) operation of such engine or motor is essential to a basic function of the vehicle or equipment, including but not limited to, operation of ready-mixed concrete trucks, lift platforms and refuse compactors; or,
   (iii) weather conditions justify the use of heating or refrigerating systems powered by the motor or engine for the safety and welfare of the operator, passengers or animals, or the preservation of perishable cargo, and the vehicle is stationary for purposes of delivery or loading; or,
   (iv) prevailing low temperatures make longer idling periods necessary immediately after starting the motor or engine; or,
   (v) the idling is for the purpose of cleaning and flushing the radiator and associated circulation system for seasonal change of antifreeze, cleaning of the fuel system, carburetor or the like, when such work is performed other than for profit.
6. The operation of a motor vehicle horn or other warning device except where required or authorized by law or in accordance with good safety practices.
7. The operation of any item of construction equipment in a Quiet Zone or Residential Area without effective muffling devices in good working order and in constant operation.

3. Prohibitions by Time and Place

No person shall emit or cause or permit the emission of sound resulting from any act listed in Table 3-1 if clearly audible at a point of reception located in an area of the municipality within a prohibited time shown for such an area.

TABLE 3-1
PROHIBITIONS BY TIME AND PLACE

		Prohibited Period of Time	
		Quiet Zone	Residential Area
1.	The detonation of fireworks or explosive devices not used in construction.	At all times	At all times
2.	The discharge of firearms.	At all times	At all times
3.	The operation of a combustion engine which, (i) is, or (ii) is used in, or (iii)is intended for use in, a toy or a model or replica of any device, which model or replica has no function other than amusement and which is not a conveyance.	At all times	At all times
4.	The operation of any electronic device or group of connected electronic devices incorporating one or more loudspeakers or other electro-mechanical transducers, and intended for the production, reproduction or amplification of sound.	At all times	C
5.	The operation of any auditory signalling device, including but not limited to the ringing of bells or gongs and the blowing of horns or sirens or whistles, or the production, reproduction or amplification of any similar sounds by electronic means except where required or authorized by law or in accordance with good safety practices.	At all times	D & E
6.	The operation of any powered rail car including but not limited to refrigeration cars, locomotives or self-propelled passenger cars, while stationary on property not owned or controlled by a railway governed by the Canada Railway Act.	At all times	B
7.	The operation of any motorized conveyance otner than on a highway or other place intended for its operation.	At all times	B

TABLE 3-1
PROHIBITIONS BY TIME AND PLACE
CONT'D

	Pronibited Period of Time	
	Quiet Zone	Residential Area
8. The venting, release or pressure relief of air, steam or other gaseous material, product or compound from any autoclave, boiler pressure vessel, pipe, valve, machine, device or system.	At all times	A
9. Persistent barking, calling or whining or other similar persistent noise making by any domestic pet or any other animal kept or used for any purpose other than agriculture.	At all times	A
10. The operation of a commercial car wash with air drying equipment.	At all times	D & E
11. Yelling, shouting, hooting, whistling or singing.	At all times	A
12. The operation of a power assisted hang glider or parafoil.	At all times	D & E
13. The operation of any item of snow making equipment.	At all times	E
14. All selling or advertising by shouting or outcry or amplified sound.	At all times	D & E
15. Loading, unloading, delivering, packing, unpacking, or otherwise handling any containers, products, materials, or refuse, whatsoever, unless necessary for the maintenance of essential services or the moving of private household effects.	D & E	D & E
16. The operation of any equipment in connection with construction.	D & E	D & E
17. The operation or use of any tool for domestic purposes other than snow removal.	C	B
18. The operation of solid waste bulk lift or refuse compacting equipment.	C	B
19. The operation of a commercial car wash of a type other than mentioned in item 10.	C	A

Prohibited Periods of Time:

A - 23 00 one day to 07 00 next day (09 00 Sundays)
B - 19 00 one day to 07 00 next day (09 00 Sundays)
C - 17 00 one day to 07 00 next day (09 00 Sundays)
D - All day Sundays and Statutory Holidays.
E - 19 00 one day to 07 00 next day.

4. General Limitations on Sound Levels Due to Stationary Sources

(1) No person shall emit or cause or permit the emission of sound from a stationary source such that the level of sound from that source at a point of reception located in a Quiet Zone or Residential Area, exceeds the applicable sound level limit prescribed in Publication NPC-105 - Stationary Sources.

(2) Subsection (1) does not apply to any equipment, apparatus or device used in agriculture for food crop seeding, chemical spraying or harvesting.

5. Limitation on Sound and Vibration Levels at a Point of Reception for Specific Sources

(1) Residential Air Conditioners

No person shall emit or cause or permit the emission of sound from the operation of a residential air conditioning device of a type referred to in Publication NPC-116 - Residential Air Conditioners, resulting in a sound level at a point of reception located in a Quiet Zone or Residential Area in excess of the applicable sound level limit set out in Publication NPC-116 - Residential Air Conditioners.

(2) Blasting Operations

No person shall emit or cause or permit the emission of sound (concussion) or vibration from a blasting operation of a type mentioned in Publication NPC-119 - Blasting, such that the peak pressure level or peak particle velocity at a point of reception located in a Quiet Zone or Residential Area, exceeds the applicable limit set out in Publication NPC-119 - Blasting.

6. Preemption

Where a source of sound is subject to both Sections 4 and 5, the less restrictive provisions shall prevail.

7. Sound Emission Standards

(1) Construction Equipment - Residential Areas

No person shall emit or cause or permit the emission of any sound from any item of construction equipment of a type referred to in Publication NPC-115 - Construction Equipment, at a work site, any part of which is located in or within 600 m of a Residential Area or a Quiet Zone, unless;

(a) the item of equipment was manufactured prior to January 1st, 1979; or

(b) the item of equipment bears a label affixed by the manufacturer or distributor which states, the year of manufacture and that the item of equipment when new complies with the Residential Area sound emission standard set out in Publication NPC-115 - Construction Equipment, as applicable to that type of equipment and date of manufacture; or

(c) the owner, operator, manufacturer or distributor provides proof that the item of equipment when new complied with the Residential Area sound emission standard set out in Publication NPC-115 - Construction Equipment, as applicable to that type of equipment and date of manufacture.

(2) Construction Equipment - Quiet Zones

No person shall emit or cause or permit the emission of any sound from any item of construction equipment of a type referred to in Publication NPC-115 - Construction Equipment, at a work site, any part of which is located in a Quiet Zone, unless:

(a) the item of equipment bears a label affixed by the manufacturer or distributor which states the year of manufacture and that the item of equipment when new complies with the Quiet Zone sound emission standard set out in Publication NPC-115 - Construction Equipment as applicable to that type of equipment and date of manufacture; or

(b) the owner, operator, manufacturer or distributor provides proof that the item of equipment when new complied with the Quiet Zone sound emission standard set out in Publication NPC-115 - Construction Equipment, as applicable to that type of equipment and date of manufacture.

(3) Domestic Outdoor Power Tools

No person shall emit or cause or permit the emission of any sound in a Residential Area or Quiet Zone from any domestic outdoor power tool of a type referred to in Publication NPC-117 - Domestic Outdoor Power Tools, which device is powered by an electric motor or an internal combustion engine unless:

(a) the device was manufactured prior to January 1st, 1979; or

(b) the device bears a label affixed by the manufacturer or distributor which states, the year of manufacture and that the device when new complies with the sound emission standard set out in Publication NPC-117 - Domestic Outdoor Power Tools, as applicable to that type of device and date of manufacture; or

(c) the owner, operator, manufacturer or distributor provides proof that the device when new complied with the sound emission standard set out in Publication NPC-117 - Domestic Outdoor Power Tools, as applicable to that type of device and date of manufacture.

(4) Air Conditioners

No person shall emit or cause or permit the emission of any sound from any air conditioning device of a type referred to in Publication NPC-116 - Residential Air Conditioners unless:

(a) the device was manufactured prior to January 1st, 1979; or

(b) the device bears a label affixed by the manufacturer or distributor which states, the year of manufacture and that the device when new complies with the sound emission standard set out in Publication NPC-116 - Residential Air Conditioners, as applicable to that type of device and date of manufacture; or

(c) the owner, operator, manufacturer or distributor provides proof that the device when new complied with the sound emission standard set out in Publication NPC-116 - Residential Air Conditioners, as applicable to that type of air conditioner and date of manufacture.

(5) Motorized Conveyances

No person shall emit or cause or permit the emission of any sound from any motorized conveyance of a type referred to in Publication NPC-118 - Motorized Conveyances unless the motorized conveyance complies with the sound emission standard set out in Publication NPC-118 - Motorized Conveyances, as applicable to that type of motorized conveyance and date of manufacture.

8. Exemption

Public Safety

Notwithstanding any other provision of this by-law, it shall be lawful to emit or cause or permit the emission of sound or vibration in connection with emergency measures undertaken:

(a) for the immediate health, safety or welfare of the inhabitants or any of them; or,

(b) for the preservation or restoration of property;

unless such sound or vibration is clearly of a longer duration or nature more disturbing, than is reasonably necessary for the accomplishment of such emergency purpose.

9. Grant of Exemption by Council

(1) Application to Council

Notwithstanding anything contained in this by-law, any person may make application to Council to be granted an exemption from any of the provisions of this by-law with respect to any source of sound or vibration for which he might be prosecuted and Council, by resolution, may refuse to grant any exemption or may grant the exemption applied for or any exemption of lesser effect and any exemption granted shall specify the time period, not in excess of six months, during which it is effective and may contain such terms and conditions as Council sees fit.

(2) Details of Application for Exemption

The application mentioned in subsection (1) shall be made in writing, in duplicate, and shall contain:

(a) the name and address of the applicant;

(b) a description of the source of sound or vibration in respect of which exemption is sought;

(c) a statement of the particular provision or provisions of the by-law from which exemption is sought;

(d) the period of time, of a duration not in excess of six months, for which the exemption is sought;

(e) the reasons why the exemption should be granted;

(f) a statement of the steps, if any, planned or presently being taken to bring about compliance with the by-law; and

(g) proof of publication within the preceding ten days, in a newspaper of general circulation within the Municipality, of a notice of intention to apply for an exemption to this by-law, containing the information required by clauses (a) through (e) hereof, and further stating the date upon which it is intended that application will be made to Council.

(3) Noise Control Officer

Council shall cause one copy of the application for exemption to be delivered to the Noise Control Officer and he shall prepare a report to Council forthwith, stating his opinion of the merits of the application and his recommendations as to terms and conditions which, in his opinion, should be imposed upon the applicant if the exemption is granted and Council will not consider the application for exemption until it has received the report of the Noise Control Officer.

(4) Report

The Noise Control Officer shall forward a copy of his report to the applicant at the address shown on the application by prepaid registered mail and shall, not sooner than two weeks after the mailing of the report to the applicant, submit the report to Council and shall, on request, make his report available for public inspection.

(5) Decision

In deciding whether to grant the exemption, Council shall consider the application, the report of the Noise Control Officer and any written submission then received by Council and made by the applicant after receipt of the report of the Noise Control Officer and the Council may consider such other matters as it sees fit.

(6) Breach

Breach by the applicant of any of the terms or conditions of the exemption shall render the exemption null and void.

10. Exemption of Traditional, Festive or Religious Activities

Notwithstanding any other provision of this by-law, this by-law does not apply to a person who emits or causes or permits the emission of sound or vibration in connection with any of the listed traditional, festive, religious and other activities:

11. Severability

If a court of competent jurisdiction should declare any section or part of a section of this by-law to be invalid, such section or part of a section shall not be construed as having persuaded or influenced Council to pass the remainder of the by-law and it is hereby declared that the remainder of the by-law shall be valid and shall remain in force.

12. Penalty

Every person who contravenes any of the provisions of this by-law is guilty of an offence and shall, upon conviction thereof, forfeit and pay a penalty of not more than $1,000.00 for a first offence and not less than $100.00 and not more than $1,000.00 for a second or subsequent offence, exclusive of costs and every such fine is recoverable under The Summary Convictions Act.

READ A FIRST AND SECOND TIME THIS day of 19 .

READ A THIRD TIME AND FINALLY PASSED THIS day of 19 .

MAYOR CLERK

I hereby certify the foregoing to be a complete and true copy of By-law Number

CLERK

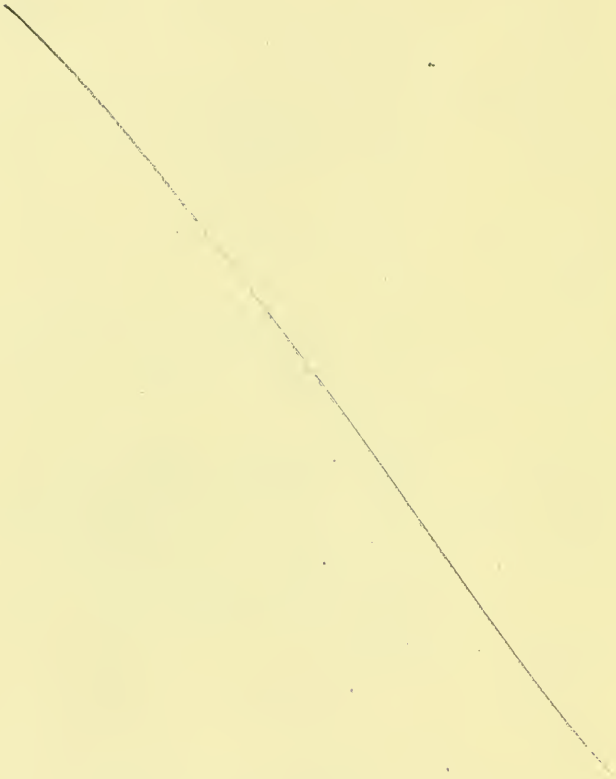
This By-law is approved pursuant to the provisions of The Environmental Protection Act, 1971, as amended, at Toronto, this day of 19 .

MINISTER OF THE ENVIRONMENT.

Schedule

Index of Publications

Publication NPC-101	Technical Definitions
Publication NPC-102	Instrumentation
Publication NPC-103	Procedures
Publication NPC-104	Sound Level Adjustments
Publication NPC-105	Stationary Sources
Publication NPC-106	Sound Levels of Road Traffic
Publication NPC-115	Construction Equipment
Publication NPC-116	Residential Air Conditioners
Publication NPC-117	Domestic Outdoor Power Tools
Publication NPC-118	Motorized Conveyances
Publication NPC-119	Blasting
Publication NPC-131	Guidelines for Noise Control in Land-Use Planning
Publication NPC-132	Guidelines for Noise Control in Rural Areas
Publication NPC-133	Guidelines on Information Required for the Assessment of Planned Stationary Sources of Sound
Publication NPC-134	Guidelines on Information Required for the Assessment of Planned New Land Uses with Respect to Sound and Vibration Impacts
Publication NPC-135	Certificate



Publication NPC-101

Technical Definitions

1. Technical Terminology and Standards

The following terminology and standards shall be used for the purposes of any Noise Control By-Law enacted pursuant to The Environmental Protection Act and all Publications of the Noise Pollution Control Section of the Pollution Control Branch of the Ministry of the Environment. The definition of any technical word used in such By-Law or this or any such Publication and not herein defined shall be the definition appearing in the applicable Publication of the Canadian Standards Association (CSA), the American National Standards Institute (ANSI), the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC), the Society of Automotive Engineers (SAE), or the Machinery and Equipment Manufacturers Association of Canada (MEMAC):

(1) Acoustic Calibrator

An "Acoustic Calibrator" is an electro-mechanical or mechanical device intended for the calibration of sound level meters and meeting the specifications of Publication NPC-102 - Instrumentation, for Acoustic Calibrators.

(2) A-Weighting

"A-weighting" is the frequency weighting characteristic as specified in IEC 123 or IEC 179 and intended to approximate the relative sensitivity of the normal human ear to different frequencies (pitches) of sound.

(3) A-weighted Sound Pressure Level

The "A-weighted sound pressure level" is the sound pressure level modified by application of the A-weighting. It is measured in decibels, A-weighted, and denoted dBA.

(4) Beating

"Beating" is the characteristic of a sound which has an audible cyclically varying sound level, caused by the interaction of two sounds of almost the same frequency.

(5) Buzzing Sounds

A "buzzing sound" is a sound which is characterized by the presence of a large number of related discrete harmonics in its frequency spectrum. These harmonics together with the fundamental frequency produce a sound which subjectively is termed a "buzz". Examples are sounds from a buzzer or a chain saw.

(11) General Purpose Sound Level Meter

A "General Purpose Sound Level Meter" is a sound level meter which meets the specifications of Publication NPC-102 - Instrumentation, for General Purpose Sound Level Meters.

(12) Impulse Response

"Impulse response" is a dynamic characteristic setting of a sound level meter meeting the specifications of Publication NPC-102 - Instrumentation, for Impulse Sound Level Meters.

(13) Impulsive Sound

An "impulsive sound" is a single pressure pulse or a single burst of pressure pulses, as defined by IEC 179A, First supplement to IEC 179, Sections 3.1 and 3.2.

(14) Impulse Sound Level

The "impulse sound level" is the sound level of an impulsive sound as measured with an Impulse Sound Level Meter set to impulse response. It is measured in A-weighted decibels, denoted dBAI.

(15) Impulse Sound Level Meter

An "Impulse Sound Level Meter" is a sound level meter which meets the specifications of Publication NPC-102 - Instrumentation, for Impulse Sound Level Meters.

(16) Integrating Sound Level Meter

An "Integrating Sound Level Meter" is a sound level meter which is capable of being used to derive the equivalent sound level (L_{eq}) and which meets the specifications of Publication NPC-102 - Instrumentation, for Type B Integrating Sound Level Meters.

(17) Logarithmic Mean Impulse Sound Level

The "Logarithmic Mean Impulse Sound Level", sometimes denoted L_{LM}, of N impulsive sounds, is ten times the logarithm to the base 10 of the arithmetic mean of ten to the power of one tenth the impulse sound level of each impulsive sound.

Algebraically, it can be written as:

$$L_{LM} = 10 \log_{10} \left[\frac{1}{N} \left(10^{dBAI_1/10} + 10^{dBAI_2/10} \ldots + 10^{dBAI_N/10} \right) \right]$$

where, $dBAI_1$, $dBAI_2$, ...$dBAI_N$, are the N impulse sound levels.

(26) Sound Level

"Sound level" is the A-weighted sound pressure level

(27) Sound Level Meter

A "sound level meter" is an instrument which is sensitive to and calibrated for the measurement of sound.

(28) Sound Pressure

The "sound pressure" is the instantaneous difference between the actual pressure and the average or barometric pressure at a given location. The unit of measurement is the micropascal (μPa) which is the same as a micronewton per square metre ($\mu N/m^2$).

(29) Sound Pressure Level

The "sound pressure level" is twenty times the logarithm to the base 10 of the ratio of the effective pressure (p) of a sound to the reference pressure (p_r) of 20 μPa. Thus the sound pressure level in dB = $20 \log_{10} \frac{p}{p_r}$.

(30) Tonality

A "tone" or a "tonal sound" is any sound which can be distinctly identified through the sensation of pitch.

(31) Vibration

"Vibration" is a temporal and spatial oscillation of displacement, velocity or acceleration in a solid medium.

(32) Vibration Velocity Detector

A "Vibration Velocity Detector" is a device which is capable of measuring vibration velocity and which meets the specifications of Publication NPC-102 - Instrumentation, for Vibration Velocity Detectors.

Technical Definitions

1. Technical Terminology and Standards

The following terminology and standards shall be used for the purposes of any Noise Control By-Law enacted pursuant to The Environmental Protection Act and all Publications of the Noise Pollution Control Section of the Pollution Control Branch of the Ministry of the Environment. The definition of any technical word used in such By-Law or this or any such Publication and not herein defined shall be the definition appearing in the applicable Publication of the Canadian Standards Association (CSA), the American National Standards Institute (ANSI), the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC), the Society of Automotive Engineers (SAE), or the Machinery and Equipment Manufacturers Association of Canada (MEMAC):

(1) Acoustic Calibrator

An "Acoustic Calibrator" is an electro-mechanical or mechanical device intended for the calibration of sound level meters and meeting the specifications of Publication NPC-102 - Instrumentation, for Acoustic Calibrators.

(2) A-Weighting

"A-weighting" is the frequency weighting characteristic as specified in IEC 123 or IEC 179 and intended to approximate the relative sensitivity of the normal human ear to different frequencies (pitches) of sound.

(3) A-weighted Sound Pressure Level

The "A-weighted sound pressure level" is the sound pressure level modified by application of the A-weighting. It is measured in decibels, A-weighted, and denoted dBA.

(4) Beating

"Beating" is the characteristic of a sound which has an audible cyclically varying sound level, caused by the interaction of two sounds of almost the same frequency.

(5) Buzzing Sounds

A "buzzing sound" is a sound which is characterized by the presence of a large number of related discrete harmonics in its frequency spectrum. These harmonics together with the fundamental frequency produce a sound which subjectively is termed a "buzz". Examples are sounds from a buzzer or a chain saw.

(6) Decibel

The "decibel" is a dimensionless measure of sound level or sound pressure level; see sound pressure level.

(7) Effective Sound Pressure

The "effective sound pressure" at a point is the root-mean square value of the instantaneous sound pressure, over a time interval, at the point under consideration as detected with a sound level meter meeting the requirements of Publication NPC-102 - Instrumentation.

(8) Equivalent Sound Level

The "equivalent sound level" sometimes denoted L_{eq}, is the value of the constant sound level which would result in exposure to the same total A-weighted energy as would the specified time-varying sound, if the constant sound level persisted over an equal time interval. It is measured in dBA.

The mathematical definition of equivalent sound level (L_{eq}) for an interval defined as occupying the period between two points in time t_1 and t_2 is:

$$L_{eq} = 10 \log_{10} \frac{1}{t_2 - t_1} \int_{t_1}^{t_2} \frac{p^2(t)}{p_r^2} \, dt$$

where p(t) is the time varying A-weighted sound pressure and p_r is the reference pressure of 20 μPa.

(9) Fast Response

"Fast response" is a dynamic characteristic setting of a sound level meter meeting the applicable specifications of Publication NPC-102 - Instrumentation.

(10) Frequency

The "frequency" of a periodic quantity is the number of times that the quantity repeats itself in a unit interval of time. The unit of measurement is hertz (Hz) which is the same as cycles per second.

(11) General Purpose Sound Level Meter

A "General Purpose Sound Level Meter" is a sound level meter which meets the specifications of Publication NPC-102 - Instrumentation, for General Purpose Sound Level Meters.

(12) Impulse Response

"Impulse response" is a dynamic characteristic setting of a sound level meter meeting the specifications of Publication NPC-102 - Instrumentation, for Impulse Sound Level Meters.

(13) Impulsive Sound

An "impulsive sound" is a single pressure pulse or a single burst of pressure pulses, as defined by IEC 179A, First supplement to IEC 179, Sections 3.1 and 3.2.

(14) Impulse Sound Level

The "impulse sound level" is the sound level of an impulsive sound as measured with an Impulse Sound Level Meter set to impulse response. It is measured in A-weighted decibels, denoted dBAI.

(15) Impulse Sound Level Meter

An "Impulse Sound Level Meter" is a sound level meter which meets the specifications of Publication NPC-102 - Instrumentation, for Impulse Sound Level Meters.

(16) Integrating Sound Level Meter

An "Integrating Sound Level Meter" is a sound level meter which is capable of being used to derive the equivalent sound level (L_{eq}) and which meets the specifications of Publication NPC-102 - Instrumentation, for Type B Integrating Sound Level Meters.

(17) Logarithmic Mean Impulse Sound Level

The "Logarithmic Mean Impulse Sound Level", sometimes denoted L_{LM}, of N impulsive sounds, is ten times the logarithm to the base 10 of the arithmetic mean of ten to the power of one tenth the impulse sound level of each impulsive sound.

Algebraically, it can be written as:

$$L_{LM} = 10 \log_{10} \left[\frac{1}{N} \left(10^{dBAI_1/10} + 10^{dBAI_2/10} \ldots + 10^{dBAI_N/10} \right) \right]$$

where, $dBAI_1$, $dBAI_2$, ...$dBAI_N$, are the N impulse sound levels.

(18) Overpressure

The "overpressure" at a point due to an acoustic disturbance is the instantaneous difference at that point between the peak pressure during the disturbance and the ambient atmospheric pressure. The unit of measurement is the pascal. One pascal, abbreviated Pa, is the same as one newton per square metre, abbreviated N/m^2.

(19) Overpressure Level

The "overpressure level" is twenty times the logarithm to the base 10 of the ratio of the peak pressure to the reference pressure of 20 μPa.

(20) Peak Particle Velocity

The "peak particle velocity" is the maximum instantaneous velocity experienced by the particles of a medium when set into transient vibratory motion. This can be derived as the magnitude of the vector sum of three orthogonal components and is measured in cm/s.

(21) Peak Pressure Level Detector

A "Peak Pressure Level Detector" is a device capable of measuring peak pressure or pressure level perturbations in air and which meets the specifications of Publication NPC-102 - Instrumentation, for Peak Pressure Level Detectors.

(22) Percentile Sound Level

The "x percentile sound level", designated L_x, is the sound level exceeded x percent of a specified time period. It is measured in dBA.

(23) Quasi-Steady Impulsive Sound

"Quasi-Steady Impulsive Sound" is a sequence of impulsive sounds emitted from the same source, having a time interval of less than 0.5 s between successive impulsive sounds.

(24) Slow Response

"Slow response" is a dynamic characteristic setting of a sound level meter meeting the applicable specifications of Publication NPC-102 - Instrumentation.

(25) Sound

"Sound" is an oscillation in pressure, stress, particle displacement or particle velocity, in a medium with internal forces (e.g. elastic, viscous), or the superposition of such propagated oscillations, which may cause an auditory sensation.

(26) Sound Level

"Sound level" is the A-weighted sound pressure level.

(27) Sound Level Meter

A "sound level meter" is an instrument which is sensitive to and calibrated for the measurement of sound.

(28) Sound Pressure

The "sound pressure" is the instantaneous difference between the actual pressure and the average or barometric pressure at a given location. The unit of measurement is the micropascal (μPa) which is the same as a micronewton per square metre ($\mu N/m^2$).

(29) Sound Pressure Level

The "sound pressure level" is twenty times the logarithm to the base 10 of the ratio of the effective pressure (p) of a sound to the reference pressure (p_r) of 20 μPa. Thus the sound pressure level in dB = $20 \log_{10} \frac{p}{p_r}$.

(30) Tonality

A "tone" or a "tonal sound" is any sound which can be distinctly identified through the sensation of pitch.

(31) Vibration

"Vibration" is a temporal and spatial oscillation of displacement, velocity or acceleration in a solid medium.

(32) Vibration Velocity Detector

A "Vibration Velocity Detector" is a device which is capable of measuring vibration velocity and which meets the specifications of Publication NPC-102 - Instrumentation, for Vibration Velocity Detectors.

Publication NPC-102

Instrumentation

1. Scope

This Publication sets out minimum specifications for equipment used for the measurement of sound and vibration. For most of the specifications the International Electrotechnical Commission (IEC) recommended standards 123 (First edition 1961), 179 (Second edition 1973) and 179A (First supplement to IEC 179, published 1973) have been adopted. In some cases, these standards are amended or augmented for greater precision.

TABLE 102-1

NPC-102 Section	Type of Instrument	Application
3	General Purpose Sound Level Meter	Non-impulsive sounds
4	Impulse Sound Level Meter	Impulsive sounds
5	Peak Pressure Level Detector	Peak pressure perturbations
6	Type B Integrating Sound Level Meter	Varying sounds of low crest factor
7	Type A Integrating Sound Level Meter	Varying sounds of high crest factor
8	Vibration Velocity Detector	Peak vibration velocity in solids
9	Acoustic Calibrator	Calibration of sound level meters

2. Technical Definitions

The technical terms used in this Publication are defined in the specifications themselves or in Publication NPC-101 - Technical Definitions.

3. General Purpose Sound Level Meter

(1) Purpose

A General Purpose Sound Level Meter is a sound level meter which is intended to be used for the measurement of non-impulsive sounds, without significant A-weighted acoustic energy above 2000 Hz.

(2) Specifications

A sound level meter which meets the following specifications is a General Purpose Sound Level Meter:

(a) the sound level meter, including a microphone equipped with a windscreen shall meet the specifications of IEC 123, except that, in addition to meeting the specifications of subclause 5.2 thereof, the microphone of the sound level meter shall also meet the specifications of subclause 5.2 amended by the substitution therein of an angle of incidence of $\pm 30^{o}$ instead of $\pm 90^{o}$, as it therein appears, and by the substitution of Table 102-2 hereof instead of Table 1, as it therein appears;

(b) the sound level meter shall incorporate A-weighting, which is specified in IEC 123 as optional;

(c) the sound level meter shall have a minimum usable range of sensitivity of from 40 dBA to 100 dBA and it shall read to an accuracy of ±1.0 dB over that range;

(d) a windscreen shall be installed on the microphone and shall not affect by more than 1 dB the tolerance prescribed in clauses (a) and (c);

(e) the sound level meter, including a microphone equipped with a windscreen, shall, when operated in the presence of wind, indicate a wind-induced sound level not in excess of the relevant value listed in Table 102-3.

4. Impulse Sound Level Meter

(1) Purpose

An Impulse Sound Level Meter is a sound level meter which is intended to be used for the measurement of any sounds, including sounds for which a General Purpose Sound Level Meter may be used.

(2) Specifications

A sound level meter which meets the following specifications is an Impulse Sound Level Meter:

(a) the sound level meter, including a microphone equipped with a windscreen, shall meet the specifications of a General Purpose Sound Level Meter;

(b) the sound level meter, including a microphone equipped with a windscreen, shall meet the specifications of IEC 179 and IEC 179A, supplement to IEC 179, including the optional characteristics mentioned in subclause 4.5 of IEC 179A;

(c) the sound level meter shall incorporate A-weighting as specified in IEC 179.

5. Peak Pressure Level Detector

(1) Purpose

A Peak Pressure Level Detector is a sound level meter which is intended to be used for the measurement of peak pressure perturbations in air. The value indicated by this device is not an average of the pressure level perturbations.

(2) Specifications

A sound level meter which meets the following specifications is a Peak Pressure Level Detector (the features of this device are incorporated in an Impulse Sound Level Meter as specified in section 4 above):

(a) the microphone of the sound level meter, when equipped with a windscreen, shall perform within a tolerance of ±1 dB throughout the frequency range of from 5 Hz to 31.5 Hz in the circumstances and conditions for use set out in Table 1 of IEC 179;

(b) the sound level meter without the microphone shall be capable of providing linear response as specified in subclause 4.5 of IEC 179, within a tolerance of ±1 dB throughout the frequency range of from 5 Hz to 15 kHz;

(c) the sound level meter shall incorporate the optional characteristics specified in subclause 4.5 of IEC 179A;

(d) the sound level meter shall meet the specifications set out in IEC 179 clause 3, subclauses 4.1, 4.2, 4.4, 4.5, 4.7, 4.8, clause 5, subclauses 6.2, 6.3, 6.4, 6.5, 6.8, 6.9, 7.1 through 7.9, 7.11, 8.1, 8.2, 8.3, 8.6 through 8.9, and the appropriate specifications of clause 10.

6. Type B Integrating Sound Level Meter

(1) Purpose

(a) An Integrating Sound Level Meter is a sound level meter which is intended to be used for the measurement of sound over a period of time, such that the equivalent sound level (L_{eq}) of the sound may be obtained.

(b) The Type B Integrating Sound Level Meter is specified with sufficient dynamic range and measurement precision to measure equivalent sound levels of general sounds that exceed limitations set out in this by-law.

(c) Either a Type A or Type B Integrating Sound Level Meter may be used for most such applications, but a Type A Integrating Sound Level Meter must be used when the sound under study

is Quasi-Steady Impulsive Sound (see NPC-103 - Procedures, sections 3 and 4) or when the operational dynamic range greatly exceeds 40 dB.

(2) General Description

The tolerances specified for the microphone, weighting and amplifier of a Type B Integrating Sound Level Meter are the same as those specified for a General Purpose Sound Level Meter in section 3 of this Publication. The computational portions of the instrument must operate within a net accuracy of ±1 dB for time periods of 20 minutes to one hour over a dynamic range of at least 40 dB with test signals having a crest factor (as defined in IEC 179A) up to 3. An operator-activated switch is included to inhibit the integration function alone and, if the system includes an elapsed-time clock, to inhibit both the integration and time summation functions.

(3) Specifications

A sound level meter which meets the following specifications is a Type B Integrating Sound Level Meter:

(a) the instrument will generally be a combination of microphone, amplifier, A-weighting network, computation circuit to obtain the integral of the mean square A-weighted pressure, display, and a means of inhibiting the integration, but may vary from the above provided that it performs the same functions within the tolerances set out below;

(b) the instrument may include computational circuitry to calculate and display the equivalent sound level directly;

(c) the microphone of the instrument shall meet the specifications of clause 5 of IEC 123, except that, in addition to meeting the specifications of subclause 5.2 thereof, the microphone shall also meet the specifications of subclause 5.2 amended by the substitution therein of an angle of incidence of ± 30^{0} instead of ± 90^{0}, as it therein appears, and by the substitution of Table 102-2 hereof instead of Table 1, as it therein appears;

(d) a windscreen shall be installed on the microphone during operation and shall not affect by more than 1 dB the tolerance prescribed in clause (c);

(e) the sound level meter, including a microphone equipped with a windscreen, shall, when operated in the presence of wind, indicate a wind-induced sound level not in excess of the relevant value listed in Table 102-3.

(f) the A-weighting network shall meet the specifications of Table II and Figure I of IEC 123;

(g) the amplifier shall meet the specifications of subclauses 7.2, 7.3 and 7.11 of IEC 123;

(h) for each sensitivity setting of the instrument the amplifier shall have a power handling capacity at least 10 dB greater than the maximum sound level specified for that sensitivity setting;

(i) if the computation circuit is of the sampling (digital) type, when operating in conjunction with the microphone, windscreen, A-weighting network and amplifier, it shall generate a signal proportional to the mean square A-weighted pressure with a 1 ±0.25 s exponential averaging time constant;

(j) the computation circuit shall integrate the mean square A-weighted pressure and shall be capable of doing so on each sensitivity setting for a minimum of 6 minutes at the maximum sound level specified for that sensitivity setting;

(k) if the computation circuit is not capable of meeting the specification of clause (j) with the reference therein to "6 minutes" changed to "60 minutes", then the device shall be provided with a means to indicate to the operator when the integration capability has been exceeded;

(l) if the computational circuit is of the sampling (digital) type, sampling shall take place at least twice per second;

(m) the computation circuit shall operate over the usable dynamic range of the instrument with a linearity of ±1 dB for any sound with a ratio of peak pressure to root mean square pressure up to 3 (crest factor up to 3);

(n) an operator-activated switch shall be provided to inhibit integration or, if the instrument has an internal elapsed time clock, to inhibit both integration and accumulation of time;

(o) the combination of windscreen, microphone, A-weighting network, amplifier and computation circuit shall have a usable dynamic range extending at least from 50 dBA to 90 dBA and the manufacturer shall specify the usable dynamic range;

(p) the instrument may be provided with more than one sensitivity setting and the manufacturer shall specify the minimum and maximum input sound level for each sensitivity setting;

(q) if the maximum sound level specified for any sensitivity setting is less than 100 dBA, the system shall include a means of indicating to the operator that the maximum input sound level for that sensitivity setting has been exceeded and such indication shall be maintained until cancelled by the operator;

(r) the display shall indicate either,

  (i) an output proportional to the integrated mean square A-weighted pressure, or

  ii) the integrated mean square A-weighted pressure divided by the duration of the period of time for which the equivalent sound level is to be determined, or

(iii) the equivalent sound level for the period of time for which the equivalent sound level is to be determined;

(s) it shall be possible to read from the display or to calculate from the reading of the display, the equivalent sound level to a resolution of ±1 dB over the usable dynamic range of the instrument for integration times from 20 minutes to 60 minutes;

(t) if the indication of the display is as described in subclause (ii) or (iii) of clause (r), the instrument shall include an elapsed-time clock;

(u) the complete instrument shall follow the recommendations and meet the specifications of subclauses 7.4, 7.5, 7.6, 7.7, 7.8 and 7.9 of IEC 123; and

(v) the instrument shall include a means of determining whether the battery of the instrument if any, has sufficient life to permit proper operation for a period of at least one hour.

7. Type A Integrating Sound Level Meter

(1) Purpose

(a) An Integrating Sound Level Meter is a sound level meter which is intended to be used for the measurement of sound over a period of time, such that the equivalent sound level (L_{eq}) of the sound may be obtained.

(b) The Type B Integrating Sound Level Meter is specified with sufficient dynamic range and measurement precision to measure equivalent sound levels of general sounds that exceed limitations set out in this by-law.

(c) Either a Type A or a Type B Integrating Sound Level Meter may be used for most such applications, but a Type A Integrating Sound Level Meter must be used when the sound under study is Quasi-Steady Impulsive Sound (see NPC-103 - Procedures, Sections 3 and 4) or when the operational dynamic range greatly exceeds 40 dB.

(2) General Description

The tolerances specified for the microphone, weighting and amplifier of a Type A Integrating Sound Level Meter are the same as those specified for a General Purpose Sound Level Meter in section 3 of this Publication. The computational portions of the instrument must operate within a net accuracy of ±1 dB for time periods of 20 minutes to one hour over a dynamic range of at least 80 dB with test signals having a crest factor (as defined in IEC 179A) up to 5. An operator activated switch is included to inhibit both the integration and time summation functions.

(3) Specifications

A sound level meter which meets the following specifications is a Type A Integrating Sound Level Meter:

(a) the sound level meter shall meet the specifications of a Type 3 Integrating Sound Level Meter;

(b) the instrument shall be provided with an internal elapsed-time clock;

(c) for each sensitivity setting of the instrument, the amplifer shall have a power handling capacity at least 14 dB greater than the maximum sound level specified for that sensitivity setting;

(d) the computation circuit shall operate over the usable dynamic range of the instrument with a linearity of ±1 dB for any sound with a ratio of peak pressure to root mean square pressure up to 5 (Crest Factor up to 5); and

(e) the combination of windscreen, microphone, A-weighting network, amplifier and computation circuit shall have a usable dynamic range extending at least from 40 dBA to 120 dBA.

.8. Vibration Velocity Detector

(1) Purpose

A Vibration Velocity Detector is a device intended to be used for the measurement of the peak particle velocity of a solid surface.

(2) Specifications

A device which meets the following specifications is a Vibration Velocity Detector:

(a) the device shall include either a transducer which responds to the total vibration vector or three transducers which have their axes of maximum sensitivity mutually orthogonal $\pm 1^{0}$;

(b) where three transducers are used to measure three mutually orthogonal components of vibration, the response of any one of the transducers to vibration in the plane normal to its axis of maximum sensitivity shall be less than 10% of its response to the same vibration along its axis of maximum sensitivity;

(c) the output of the device shall be proportional to the velocity of the surface on which the transducer is, or the transducers are, mounted and the output of the device shall be in such form that the device indicates, or can be used to calculate, the peak particle velocity in the frequency range of from 5 Hz to 500 Hz over a range of peak particle velocity of from 0.25 cm/s to 10 cm/s with a tolerance of ±10%; and

(d) it shall be possible to field-calibrate the device with an accuracy of ±5% using either a reference electrical signal in series with the equivalent transducer impedance or a reference vibration source.

9. Acoustic Calibrator

(1) Purpose

An Acoustic Calibrator is an electro-mechanical or mechanical device which produces sound of a known frequency and which, when coupled to a sound level meter, produces a predictable response in the sound level meter if the sound level meter is operating properly at the calibration frequency.

(2) Specifications

A device, capable of producing sound, which meets the following specifications is an Acoustic Calibrator:

(a) the device shall be capable of being physically attached to a sound level meter in such a way that the device and the sound level meter are "acoustically coupled", that is, sound from the device is transmitted through the air by way of a chamber formed by the attachment of the device to the microphone of the sound level meter;

(b) the device shall produce sound of a stated frequency, within a frequency tolerance of ±5%;

(c) the manufacturer of the device shall provide with the device, any data required in order to determine the sound level reading which should be indicated on the sound level meter when calibrated for those microphone and sound level meter types with which the manufacturer recommends the device be used. Where additional accessories must be used to provide this sound level reading, the manufacturer shall state that they must be used;

(d) the maximum tolerance in the sound pressure level generated by the device when coupled to the microphone shall apply over an atmospheric pressure range of 87 kPa to 107 kPa, and shall be ±0.5 dB over the temperature range of from $0^{o}C$ to $40^{o}C$ and ±1.0 dB over the temperature range of from $-10^{o}C$ to $50^{o}C$;

(e) if the device is battery powered, means for checking the battery condition shall be included with the device;

(f) the following data shall be provided with the device by the manufacturer,

(i) the nominal sound pressure level produced,

(ii) the nominal frequency at which the device operates,

(iii) the ranges of temperature and atmospheric pressure over which the device is intended to operate, and the applicable overall sound pressure level tolerance for these ranges.

TABLE 102-2

Permissible Tolerances on Microphone Sensitivity
Over an Angle of ± 30°

Frequency Hz	Permissible Tolerances dB	
	A*	B**
31.5 - 500	±1	±1
1000	±1	±1
2000	±2	+ 1 - 2
4000	±4	+ 1 - 4
8000	±10	+ 1 - 10

* COLUMN A: The microphone is mounted on the sound level meter.

** COLUMN B: The microphone is physically separated from the sound level meter but electrically connected thereto.

TABLE 102-3

Maximum Wind Induced Sound Level Indication Using A-weighting and Slow Response (where available)

Wind Speed	dBA
15 km/h	41
20 km/h	48
25 km/h	53

Procedures

1. Scope

This Publication comprises the various measurement procedures to be used in connection with other Publications which provide limits or standards for sound or vibration. Several of the procedures adopted are those of nationally or internationally recognized agencies. Table 103-1 lists the measurement procedures which are included in this Publication.

TABLE 103-1

NPC-103 Section	Type of Measurement	Procedure
3	Steady or impulsive sound	Ministry
4	Varying sound	Ministry
5	Sound and vibration from blasting	Ministry
6	Powered mobile construction equipment	SAE J88a
7	Pneumatic equipment	MEMAC
8	Small engines	SAE J1046
9	Trucks with governed diesel engines	CSA Z107.22-M

2. Technical Definitions

The technical terms used in a procedure shall have the meaning given either in that procedure or in Publication NPC-101 - Technical Definitions.

3. Procedure for Measurement of Steady or Impulsive Sound

(1) (a) Classification

For the purposes of this procedure sounds can conveniently be placed in four mutually exclusive categories as follow

(i) impulsive sounds, other than Quasi-Steady Impulsive Sounds, such as, but not limited to, the sound from gunshots, certain explosive pest control devices and certain industrial metal working operations (e.g. forging, hammering, punching, stamping, cutting, forming and moulding);

(ii) Quasi-Steady Impulsive Sounds, such as, but not limited to, the sound from pavement breakers, riveting guns, ineffectively muffled internal combustion engines or ineffectively muffled air compressors;

(iii) buzzing sounds, such as, but not limited to, the sounds from positive displacement blowers, chain saws, small combustion engines and concrete finishers;

(iv) all other sounds.

(b) Application

This procedure applies to measurements at a point of reception of:

(i) sound of a type mentioned in category (i) or (ii) of clause (a); and

(ii) sound of a type mentioned in categories (iii) or (iv) of clause (a), which is always higher than the permissible level or which, when the sound is present, does not vary in level over a range of more than 6 dB during the period of observation.

(2) Instrumentation

(a) Sound Level Meter

(i) An Impulse Sound Level Meter shall be used for the measurement of sound in category (i), (ii) or (iii) of clause 3(1) (a).

(ii) A General Purpose Sound Level Meter shall be used for the measurement of sound in category (iv) of clause 3(1) (a).
NOTE: An Integrating Sound Level Meter may be used for the measurement of sound in category (iv) of clause 3(1) (a), but the procedure set out in section 4 - Procedure for Measurement of Varying Sound must be used.

(b) Calibrator

An Acoustic Calibrator shall be used.

(c) Windscreen

A windscreen shall be used in all outdoor measurements.

Publication NPC-103

Procedures

1. Scope

This Publication comprises the various measurement procedures to be used in connection with other Publications which provide limits or standards for sound or vibration. Several of the procedures adopted are those of nationally or internationally recognized agencies. Table 103-1 lists the measurement procedures which are included in this Publication.

TABLE 103-1

NPC-103 Section	Type of Measurement	Procedure
3	Steady or impulsive sound	Ministry
4	Varying sound	Ministry
5	Sound and vibration from blasting	Ministry
6	Powered mobile construction equipment	SAE J88a
7	Pneumatic equipment	MEMAC
8	Small engines	SAE J1046
9	Trucks with governed diesel engines	CSA Z107.22-M

2. Technical Definitions

The technical terms used in a procedure shall have the meaning given either in that procedure or in Publication NPC-101 - Technical Definitions.

(3) Measurement Location

For sound transmitted solely through air, the measurement location shall be one or more of the following points of reception:

(a) a location out-of-doors where a person may be exposed to the sound; or

(b) the plane of an exterior door or window of a room in which a person may be exposed to the sound, where the door or window is open.

(4) Use of Instrumentation

(a) Battery Check

If the sound level meter is battery powered the condition of the battery shall be checked after the meter has been allowed to warm up and stabilize. The battery condition shall be rechecked at least once per hour during a series of measurements and at the conclusion of such measurements. The meter shall not be used unless the battery condition is confirmed to be within the range recommended by the manufacturer for proper operation.

(b) Calibration

The sound level meter shall be calibrated after the meter has been allowed to warm up and stabilize, at least once per hour during a series of measurements and at the conclusion of such measurements.

(c) Sound Level Meter Settings

Measurements shall be taken using the following response settings:

(i) Impulse Response (dBAI)

The impulse response and A-weighting shall be used for impulsive sound in category (i) of clause 3 (1)(a). An 'impulse hold' facility may be used if available on the meter.

(ii) Slow Response (dBA)

The slow response and A-weighting shall be used for sound in categories (ii), (iii) or (iv) of clause 3 (1)(a).

(d) Instrument Configuration

(i) Reflective Surfaces

The microphone shall be located not less than 1 m above the ground, not less than 1 m from any sound reflective surface except for the purposes of clause 3(3)(b) and not less than arm's length from the body of the person operating the meter. Not more than one person, other than the operator of the meter, shall be within 7 m of the microphone and that person shall be behind the operator of the meter.

For the case of clause 3(3)(b) the microphone shall be in the middle of the aperture located not less than 15 cm from the window frame or door frame.

(ii) Microphone Orientation

The microphone shall be oriented such that the sound to be measured is incident at an angle recommended by the microphone manufacturer for flattest frequency response in a free field.

(e) Measurement - Slow Response

(i) Readings Taken

For sound in categories (ii), (iii) or (iv) of clause 3 (1)(a), a minimum of three observations with a minimum observation time of 15 s each shall be made. The observed average reading for each of the observations shall be noted as well as the minimum and the maximum of the range of sound levels during each observation period. If the difference between any two observed average readings is greater than 3 dB, a minimum of six observations shall be made. For the purpose of adjustments for intermittency the duration of the sound in any one hour shall be noted.

(ii) Readings Reported

The arithmetic mean of the observed average readings shall be reported, rounded to the nearest decibel. Adjustments for intermittence and quality of sound shall be made in accordance with Publication NPC-104 - Sound Level Adjustments, and the result shall be reported. The result is the one hour equivalent sound level (L_{eq}) of the sound under study for any one hour period during which the readings were taken pursuant to subclause (i).

(iii) Wide Variation of Sound Levels

If, in making observations pursuant to subclause (i), there is a difference of more than 6 dB between the lowest and highest values of the observed ranges of sound levels, this procedure shall not be used unless the lower limit of each such range is above the maximum permissible level. Instead, the procedure set out in Section 4 - Procedure for Measurement of Varying Sound at a point of reception, shall be used.

(f) Measurement - Impulse Response - Frequent Impulses

(i) Readings Taken

For sound in category (i) of clause 3(1)(a), not less than 20 impulses shall be measured within a continuous period of 20 minutes and each measurement taken shall be reported.

(ii) Extension of Time

Where a minimum of 20 impulses cannot be measured within a continuous period of 20 minutes pursuant to subclause (i) the time period may be extended to 2 hours if an impulse occurred in each of the four consecutive periods of five minutes each during the initial 20 minute measurement period.

(iii) Level Reported

The Logarithmic Mean Impulse Sound Level (L_{LM}) of the 20 or more measurements shall be calculated and reported to the nearest decibel. This Logarithmic Mean Impulse Sound Level is a valid and effective sound level for any one hour period during which readings were taken pursuant to subclauses (i) and (ii).

(g) Measurement - Impulse Response - Single Event

Readings Taken and Reported

For impulsive sounds in category (i) of clause 3(1)(a), that occur as single, seemingly independent events not normally measurable using the procedure set out in clause (f) for frequent impulses, each impulse shall be independently measured and each impulse sound level reported to the nearest decibel.

(h) Variation in Calibration

Measurements shall not be reported if the sound level meter calibration has changed more than 0.5 dB from the previous calibration.

(i) Weather Conditions

(i) Wind

Measurements shall not be taken unless the wind-induced sound level is more than 10 dB below the measured levels. Reference should be made to Publication NPC-102 - Instrumentation, particularly Table 102-3.

(ii) Humidity

Measurements shall not be taken if the relative humidity is above the maximum for which the meter specification is guaranteed by the manufacturer (normally 90%).

(iii) Precipitation

Measurements shall not be taken during precipitation.

(iv) Temperature

Measurements shall not be taken when the air temperature is outside the range for which the specification of the instrument is guaranteed by the manufacturer. (Normally, only the lower temperature limit is significant.)

(5) Documentation

The following represents the minimum information which shall be contained in a report of an investigation where the above procedure was used. (Adapted from CSA Z107.2-1973 Methods for the Measurement of Sound Pressure Levels.)

(a) Acoustic Environment

(i) Location and description of sound sources.

(ii) Dimensioned sketch including photographs, if possible, of the location of the sound source and the point of reception, showing all buildings, trees, structures and any other sound reflective surfaces.

(iii) Physical and topographical description of the ground surface.

(iv) Meteorological conditions prevailing at the time of the investigation including approximate local wind speed in km/h, wind direction, air temperature in ^{o}C, approximate relative humidity and extent of cloud cover.

(b) Instrumentation

All the equipment used for making sound level measurements shall be listed, including:

(i) type, model and serial number of sound level meter;

(ii) type, model and serial number of microphone;

(iii) type, model and serial number of Acoustic Calibrator;

(iv) extension cables and additional amplifier, if used.

(c) Acoustical Data

The measurement details shall be described, including:

(i) the location of the microphone, using a sketch if necessary;

(ii) measurements or readings obtained, preferably listed in tabular form, referencing location on a sketch or map, time periods involved, and relevant data required for making calculations;

(iii) adjustments made for quality of sound or intermittence;

(iv) details of any calculations;

(v) comparison with applicable sound level limits, standards or guidelines.

4. Procedure for Measurement of Varying Sound

(1) (a) Classification

For the purposes of this procedure sounds can conveniently be placed in four mutually exclusive categories as follows.

(i) impulsive sounds, other than Quasi-Steady Impulsive Sounds, such as, but not limited to, the sound from gunshots, certain explosive pest control devices and certain industrial metal working operations (e.g. forging, hammering, punching, stamping, cutting, forming and moulding);

(ii) Quasi-Steady Impulsive Sounds, such as, but not limited to, the sound from pavement breakers, riveting guns, ineffectively muffled internal combustion engines or ineffectively muffled air compressors;

(iii) buzzing sounds, such as, but not limited to the sound from positive displacement blowers, chain saws, small combustion engines and concrete finishers;

(iv) all other sounds.

(b) Application

This procedure applies to measurements at a point of reception of continuous or intermittent sound mentioned in category (ii), (iii) or (iv) of clause (a).

(2) Instrumentation

(a) Integrating Sound Level Meter

An Integrating Sound Level Meter shall be used which is appropriate for the sound to be measured:

(i) Either a Type A or Type B Integrating Sound Level Meter may be used for the measurement of sound in category (iv) of clause 4(1)(a);

(ii) A Type A Integrating Sound Level Meter shall be used for the measurement of sound in categories (ii) or (iii) of clause 4(1)(a).

(b) Calibrator

An Acoustic Calibrator shall be used.

(c) Windscreen

A windscreen shall be used in all outdoor measurements.

(3) Measurement Location

(a) Air-Borne Sound

For sound transmitted solely through air, the measurement location shall be one or more of the following points of reception:

(i) a location out-of-doors where a person may be exposed to the sound; or

(ii) the plane of an exterior door or window of a room in which a person may be exposed to the sound, where the door or window is open.

(4) Use of Instrumentation

(a) Battery Check

If the Integrating Sound Level Meter uses a battery, the condition of the battery shall be checked before each measurement, and measurement shall not commence unless the battery has sufficient life remaining to permit proper operation for a period of at least one hour.

(b) Calibration

The Integrating Sound Level Meter shall be calibrated before and after each measurement period.

(c) Instrument Configuration

(i) Reflective Surfaces

The microphone shall be located not less than 1 m above the ground, not less than 1 m from any sound reflective surface except for the purposes of subclause 4(3)(a)(ii) and not less than arm's length from the body of the person operating the meter. Not more than one person, other than the operator of the meter, shall be within 7 m of the microphone and that person shall be behind the operator of the meter. For the case of subclause 4(3)(a)(ii) the microphone shall be in the middle of the aperture located not less than 15 cm from the window frame or door frame.

(ii) Microphone Orientation

The microphone shall be oriented such that the sound to be measured is incident at an angle recommended by the microphone manufacturer for flattest frequency response in a free field.

(d) Extraneous Sources

When measuring the sound from a source, integration shall from time to time be inhibited by the operator immediately when the received sound is dominated by sound from a source other than the source under study and it shall remain inhibited while such a condition persists and for at least 10 seconds thereafter. While integration is inhibited the elapsed time used to calculate the equivalent sound level shall not be allowed to accumulate.

(e) Timing

If the Integrating Sound Level Meter is not provided with an internal elapsed-time clock, the operator shall accumulate the elapsed time during the measurement period by means of a stop-watch or other time measuring device.

(f) Readings

(i) Stationary Source

When measuring the sound from a stationary source, measurements to be used in calculating results shall be taken during a continuous period not in excess of one hour and, for purposes of calculation and reporting of

results, the accumulated elapsed time of measurement as obtained in accordance with clause (d) is deemed to be one hour if the accumulated time is 20 minutes or more. Measurements containing information from an accumulated time period of less than 20 minutes are insufficient for purposes of calculating the equivalent sound level (L_{eq}) of a stationary source.

(ii) Road Traffic Noise Sources

When measuring the sound from road traffic the accumulated elapsed time obtained in accordance with clause (d) shall not be less than twenty minutes and the actual accumulated elapsed time of measurement shall be used for purposes of calculation.

(g) Adjustments

Adjustments for quality of sound shall be made in accordance with Publication NPC-104 - Sound Level Adjustments and the result reported. No adjustment shall be made for intermittence.

(h) Variation in Calibration

A measurement shall not be reported if the Integrating Sound Level Meter calibration after the measurement period is more than 0.5 dB different from that before the measurement commenced.

(i) Weather Conditions

(i) Wind

Measurements shall not be made unless the wind-induced sound level is more than 10 dB below the measured levels. Reference should be made to Publication NPC-102-Instrumentation and particularly Table 102-3.

(ii) Humidity

Measurements shall not be taken if the relative humidity is above the maximum for which the meter specification is guaranteed by the manufacturer (normally 90%).

(iii) Precipitation

Measurements shall not be taken during precipitation.

(iv) Temperature

Measurements shall not be taken when the air temperature is outside the range for which the specification of the instrument is guaranteed by the manufacturer. (Normally, only the lower temperature limit is significant.)

(j) Readings Reported

(i) For sound from a stationary source, the value to be reported based on measurements made during the accumulated elapsed time of 20 minutes or more and the time period for calculation which is one hour is, after adjustment in accordance with clause (g), the one hour equivalent sound level (L_{eq}) of the sound under study for any one hour period during which measurements were taken pursuant to subclause 4(4)(f)(i).

(ii) For sound from road traffic, the value to be reported based on measurements made during the accumulated elapsed time of 20 minutes or more and the time period for calculation which is the actual accumulated elapsed time, is the one hour equivalent sound level (L_{eq}) of the sound under study for any one hour period during which measurements were taken pursuant to subclause 4(4)(f)(ii).

(iii) The one hour equivalent sound level (L_{eq}) shall be reported to the nearest decibel.

(5) Documentation

The following represents the minimum information which shall be contained in a report of an investigation where the above procedure was used. (Adapted from CSA Z107.2-1973 Methods for the Measurement of Sound Pressure Levels.)

(a) Acoustic Environment

(i) Location and description of sound sources.

(ii) A list of the types of extraneous noise sources which caused integration to be inhibited during measurement.

(iii) Dimensioned sketch including photographs, if possible, of the location of the sound source and the point of reception, showing all buildings, trees, structures and any other sound reflective surfaces.

(iv) Physical and topographical description of the ground surface.

(v) Meteorological conditions prevailing at the time of the investigation including approximate local wind speed in km/h, wind direction, air temperature in ^{o}C, approximate relative humidity and extent of cloud cover.

(b) Instrumentation

All the equipment used for making sound level measurements shall be listed, including:

(i) type, model and serial number of Integrating Sound Level Meter;

(ii) type, model and serial number of microphone;

(iii) type, model and serial number of Acoustic Calibrator;

(iv) extension cables and additional amplifier, if used.

(c) Acoustical Data

The measurement details shall be described, including:

(i) the location of the microphone, using a sketch if necessary;

(ii) the continuous time period of observation;

(iii) the accumulated elapsed time of measurement following the procedure of clauses 4(4)(d) and (e);

(iv) the Integrating Sound Level Meter reading or output and any other relevant data required for calculations;

(v) adjustments made for quality of sound;

(vi) details of all calculations;

(vii) the equivalent sound levels obtained, preferably listed in tabular form, referencing location on a sketch or map;

(viii) comparision with applicable sound level limits, standards or guidelines.

5. Procedure for Measurement of Sound and Vibration Due to Blasting Operations

(1) Application

This procedure applies to the measurement of sound (concussion) and vibration due to blasting operations.

(2) Sound

(a) Instrumentation

(i) Measuring Device

A Peak Pressure Level Detector shall be used.

(ii) Calibrator

An Acoustic Calibrator shall be used.

(iii) Windscreen

A windscreen shall be used in all outdoor measurements.

(b) Measurement Location

The measurement location shall be at a point of reception out-of-doors within 7 m of a building.

(c) Use of Instrumentation

(i) Battery Check

If the measuring device is battery powered, the condition of the battery shall be checked after the device has been allowed to warm up and stabilize and after each measurement has been made. The device shall not be used unless the battery condition is confirmed to be within the range recommended by the manufacturer for proper operation.

(ii) Calibration

The measuring device shall be calibrated after it has been allowed to warm up and stabilize and after each measurement has been made.

(iii) Meter Setting

The measuring device shall be set to read the peak pressure level using linear response and a 'hold' facility, if available.

(d) Instrument Configuration

(i) Reflective Surfaces

The microphone shall be located not less than 1 m above the ground, not less than 1 m from any sound reflective surface and not less than arm's length from the body of the person operating the device. Not more than one person, other than the operator of the meter, shall be within 7 m of the microphone and that person shall be behind the operator of the meter.

(ii) Microphone Orientation

The microphone shall be oriented such that the concussion wave to be measured is incident at an angle recommended by the microphone manufacturer for flattest frequency response in a free field.

(e) Readings

(i) Peak Pressure Level

The value of peak pressure level reported shall be given to the nearest decibel.

(ii) Variation in Calibration

A measurement shall not be reported if the meter calibration after the measurement is more than 0.5 dB different from that before the measurement.

(iii) Battery Deterioration

A measurement shall not be reported if the battery condition after the measurement is not within the range recommended by the manufacturer for proper operation.

(f) Weather Conditions

(i) Wind

Measurements shall not be reported unless the wind-induced sound pressure level is more than 10 dB below the measured peak pressure level. Reference should be made to Publication NPC-102 - Instrumentation.

(ii) Humidity

Measurements shall not be taken if the relative humidity is above the maximum for which the meter specification is guaranteed by the manufacturer (normally 90%).

(iii) Precipitation

Measurements shall not be taken during precipitation.

(iv) Temperature

Measurements shall not be taken when the air temperature is outside the range for which the meter specification is guaranteed by the manufacturer. (Normally only the lower temperature limit is significant.)

(3) Vibration

(a) Instrumentation

(i) Measuring Device

A Vibration Velocity Detector shall be used.

(ii) Calibrator

An electrical reference signal of known voltage and frequency shall be used in the field for calibration of the Vibration Velocity Detector excluding the transducer. A reference vibration source shall be used for laboratory calibration of the complete Vibration Velocity Detector.

(b) Measurement Location

Vibration measurements shall be made at a point of reception inside a building below grade or less than 1 m above grade, preferably on a basement floor close to an outside corner.

(c) Use of Instrumentation

(i) Battery Check

If the measuring device is battery powered, the condition of the battery shall be checked after the device has been allowed to warm up and stabilize and after each measurement has been made. The device shall not be used unless the battery condition is confirmed to be within the range recommended by the manufacturer for proper operation.

(ii) Calibration

Field calibration shall be carried out before and after each measurement. Laboratory calibration of the complete Vibration Velocity Detector as used in the field, including the transducer, shall be carried out not less than once per calendar year and the results certified.

(d) Instrument Configuration

(i) Mounting

The transducer shall be affixed to a part of the structure so as to prevent movement of the transducer relative to the structure. The preferred structural element is the basement floor as indicated in clause (b).

(ii) Transducer Orientation

If three vector components of vibration velocity are recorded individually, it is preferable to orient the transducers such that the three axes of measurement are (a) vertical, (b) radial (along a horizontal line joining the location of the blast to the location of measurement) and, (c) transverse (along a horizontal line at right angles to the line joining the location of the blast to the location of measurement).

(e) Readings

(i) Peak Particle Velocity

The peak particle velocity in cm/s shall be reported.

(ii) Variation in Calibration

A measurement shall not be reported if calibration after the measurement is more than 5% different from that before the measurement.

(iii) Battery Deterioration

A measurement shall not be reported if the battery condition after the measurement is not within the range recommended by the manufacturer for proper operation.

(4) Documentation

The following represents the minimum information which shall be contained in a report of an investigation where the above procedure was used.

(a) Description of Area

(i) Location and description of the blasting operation.

(ii) Dimensioned sketch including photographs, if possible, of the location of the blasting operation, the nearest premises and the measurement location.

(iii) Description of the measurement location.

(iv) Physical and topographical description of the ground surface.

(v) Meteorological conditions at the time of the investigation, including approximate wind speed in km/h, wind direction, air temperature in degrees Celsius, approximate relative humidity, degree of cloud cover and whether or not a condition of thermal inversion prevailed.

(b) Instrumentation

All the equipment used for making sound and vibration measurements shall be listed, including:

(i) type, model and serial number of Peak Pressure Level Detector;

(ii) type, model and serial number of microphone;

(iii) type, model and serial number of Acoustic Calibrator;

(iv) windscreen;

(v) extension cables and additional amplifiers, if used;

(vi) type, model and serial number of Vibration Velocity Detector;

(vii) type, model and serial number of transducers.

(viii) type, model and serial number of vibration calibrator.

(c) Sound and Vibration Data

The measurement details shall be described, including:

(i) the location where measurements were taken, the time period involved and the orientation of instrumentation using a sketch, if necessary;

(ii) details of all calculations;

(iii) the peak pressure level in dB and/or peak particle velocity in cm/s;

(iv) comparison with applicable peak pressure limits and/or peak particle velocity limits.

6. Exterior Sound Level Measurement Procedure For Powered Mobile Construction Equipment - SAE J88a

SAE J88a Recommended Practice is adopted by the Ministry with the following change:

Where ANSI Type 1 sound level meter specification is referred to, reference shall be made instead to Publication IEC-179 (1973) for Precision sound level meters. (General Purpose Sound Level Meter)

7. MEMAC Test Code For the Measurement of Sound From Pneumatic Equipment

The MEMAC Test Code For The Measurement Of Sound From Pneumatic Equipment is adopted by the Ministry with the following additional requirement:

For measurement of percussive machines the sound level meter used shall meet the specifications of IEC Publications 179 and 179A (1973). (Impulse Sound Level Meter)

8. Exterior Sound Level Measurement Procedure For Small Engine Powered Equipment - SAE J 1046

SAE J 1046 - Recommended Practice, is adopted by the Ministry with the following changes:

(1) Where ANSI Type 1 sound level meter specification is referred to, reference shall be made instead to IEC Publications 179 and 179A (1973). (Impulse Sound Level Meter)

(2) Replace clause 3.1.1 with the following:
The minimum dimensions of the measurement zone are defined as a path of travel 1.2 m wide by 14 m long plus an adjacent area having the base along the edge of the path of travel and the apex 7 m from the midpoint of the base.

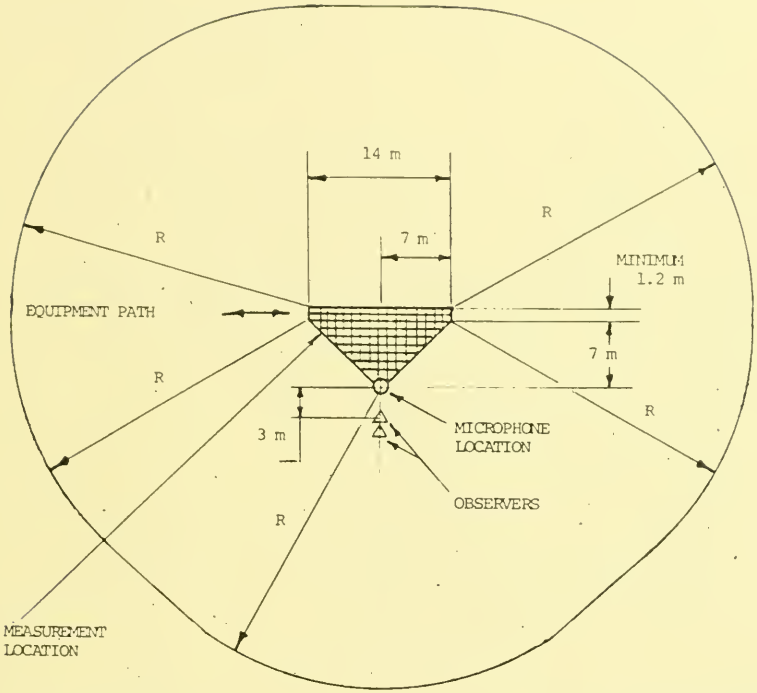
(3) Replace Fig. 1 with Fig. 103-1, hereof.

(4) In section 3.3 Measurements, all references to 25 ft. shall be changed to 7 m.

9. Procedure for Measurement of the Maximum Exterior Sound Level of Stationary Trucks with Governed Diesel Engines-CSA Z107.22-M1977

(1) CSA Z107.22-M1977 standard is adopted by the Ministry with the following change:

A General Purpose Sound Level Meter shall be used.



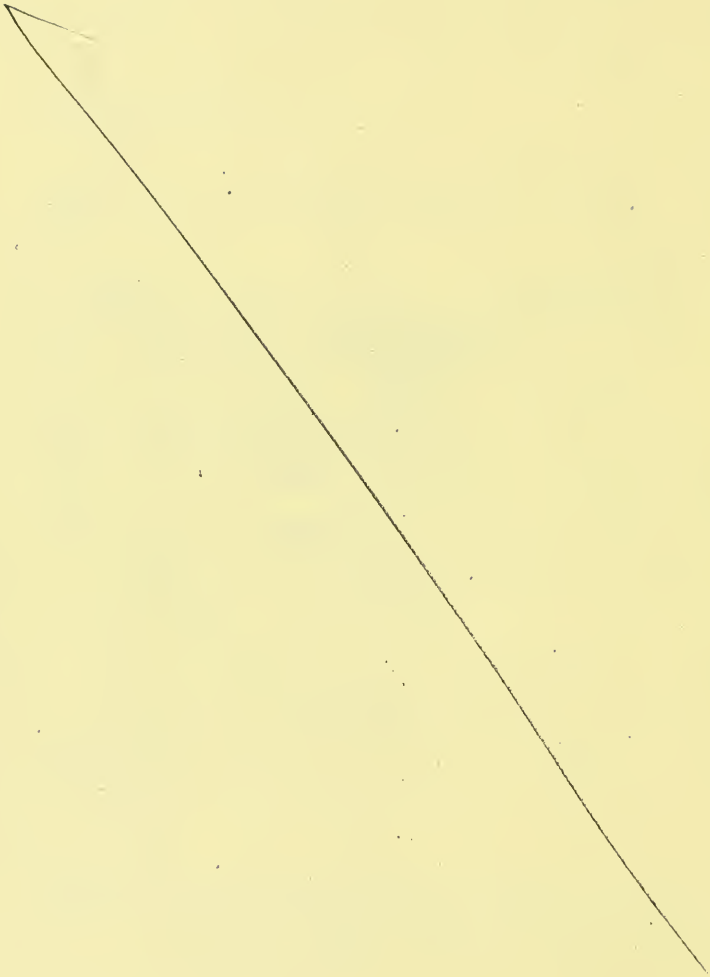
REF. US EPA 550/9-74-011

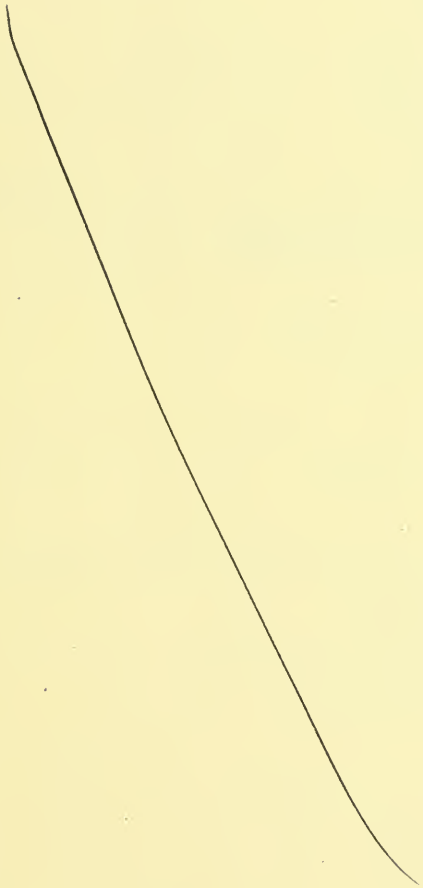
R = 30 m MINIMUM RADIUS

TEST SITE CONFIGURATION FOR EXTERIOR SOUND LEVEL MEASUREMENT

PROCEDURE FOR SMALL ENGINE POWERED EQUIPMENT - SAE J 1046

FIG. 103-1





APPENDIX

Publications of the Ontario Ministry of the Environment

- Model Municipal Noise Control By-Law and Noise Pollution Control Publications (NPC-100 to NPC-135 Inclusive)
- Training Manuals
  - Environmental Acoustics Technology I to IV
  - Acoustics Technology in Land-Use Planning, Volumes I and II

Publications of the Ontario Ministry of Transportation & Communications

- Traffic Volumes on the King's Highway and Secondary Highways (Revised Annually)

These Publications are obtainable from:

Ontario Government Bookstore
880 Bay Street
Toronto, Canada
M7A 1N8 Tel. (416) 965-2054

Also recommended for land use planning are publications of the Central Mortgage and Housing Corporation of Canada

- Site Planning Criteria
- Road and Rail Noise, Effects on Housing
- New Housing and Airport Noise

Acoustics III

Review of Acoustics II; Theory; Law; Stop orders, Control orders, Provincial officer's report; Prosecutions; Graphic analyser; Statistical analyser; Sound descriptors, percentiles, cumulative and statistical distribution; Vibration analysis; Stationary source noise analysis; Laboratory; Field work; Examination.

Acoustics IV

Review of Acoustics III; Theory; Law; Use of digital monitors; Off-road and road side traffic measurements; Field investigation and reports; Technical Publications; Implementation of a Noise By-Law; Advanced procedures; Selection of instrumentation; Examination.

7. Audiometric Test

Candidates for their first Certificate and for any reissue of a Certificate shall submit to a binaural audiometric test. Test results shall in every case be disclosed to the candidate and to the sponsoring employer.

8. Training Manuals

Training manuals in "Environmental Acoustics Technology" I to IV, are available as separate documents from the Ontario Government Bookstore, 880 Bay Street, Toronto, M7A 1N8.

Publication NPC-135

Certificate

1. Scope

This Publication sets out the minimum requirements for granting a Certificate of Competency in Environmental Acoustics Technology.

2. Certification

A Certificate of the specified class shall be issued by the Minister to any person who has satisfactorily completed the following training courses in Environmental Acoustics Technology, offered by the Ministry:

Certificate Class	Training Courses
1	Acoustics I and II
2	Acoustics I, II, and III
3	Acoustics I, II, III and IV

3. Exemptions

Persons having successfully completed mathematics and physics courses at a level one year beyond Grade 13 or two years beyond Grade 12 shall be deemed to have satisfactorily completed Acoustics I. The Minister may, in his sole discretion, grant further or other exemptions.

4. Certificate Renewal

Each Certificate issued by the Minister shall expire three years from the date of issue. The Certificate will be reissued for a further three year period on successful completion of the appropriate refresher course approved by the Minister.

5. Other Courses

For purposes of Certification, courses in acoustics offered by other teaching institutions may be approved by the Minister where they cover the subject matter set out in section 6 below.

6. Curriculum

Acoustics I

Introductory Acoustic Theory; Law; Handling of Complaints; Use of simple sound level meter, octave band analyser and calibration techniques; Measurement of traffic noise and industrial noise; Procedures; Audiometry; Personal hearing test; Examination.

Acoustics II

Review of Acoustics 1; Theory; Law; Complaint investigations; National and International Standards; Use of 1/3 octave analyser; Tape recorder; Impulse sound level meter; Introduction to L_{eq}; Field work; Examination.

(ii) sound levels at the site due to individual sources, preferably summarized in a Table;

(iii) combined sound levels at the site due to individual sound sources, preferably tabulated for representative locations;

(iv) a comparison between the projected sound levels on the site and the applicable standard;

(v) the excess sound level above the applicable standard should be tabulated, if any;

(vi) the location, nature and dimensions of noise attenuating structures or other noise control measures required to eliminate any excess over the applicable standard;

(vii) where the report is intended to clear conditions of draft approval leading to registration of the plan of subdivision, all sound control measures should be sufficiently detailed to be entered into the Subdivision Agreement or the Engineering Agreement required by the municipality. The detailed indoor and outdoor sound control measures should be listed in a manner permitting ready checking off by an authorized building inspector during construction; and

(viii) where the report is in the form of a feasibility study leading to draft approval of a subdivision, it would suffice to indicate the location and the nature of outdoor and indoor sound control measures.

(b) Appendices to the Report

The following information should be provided as appendices to the main body of the report:

1. projected data for train and highway traffic and growth due to airports and industry. Sources of data should be provided;
2. details of sound level measurements and equipment used; and
3. calculations used in predicting sound levels, barrier height and other acoustical aspects of the report.

6. Transmittal of Information

Reports prepared for submission to the approving authority or a municipality are normally circulated in the Ministry. Technical assistance in preparing a report may be obtained from the Noise Pollution Control Section of the Pollution Control Branch of the Ministry.

(d) assessment of the impact of major projects requires extensive sound level mapping and, since zoning changes can usually be expected to follow, a complete on-going record of the relevant sound level contours of the area becomes an essential reference in the approval process A program of sound level monitoring should be submitted by the proponent;

(e) the present level of road and rail traffic in the vicinity should be stated and any expected increase in such traffic should be projected forward for a period of at least ten years;

(f) where noise control measures or abatement measures are required to reduce present or future sound problems, detailed information should be provided on the planned measures and the estimated effect.

3. Preparation of Impact Statement

The extent of sound monitoring or prediction of sound levels should be discussed with the Ministry at an early stage of planning. An impact statement must be prepared which adequately describes the present conditions and the predicted changes over, at least, a ten year period.

5. Report Format

Information provided in a report should conform to the following general format. Analysis and evaluation by the Ministry will consist of checking the validity of the information based on the best available technology. Observance of the required format may expedite approval by the Ministry.

(1) Planning Objectives

The scope of information provided should be predicated on, and include a statement of the planning objectives of the municipality and a statement of the planning objectives of the approving authority, if other than the municipality.

(2) Organization of the Report

The information should be presented in a concise, itemized form with appropriate headings. Sufficient copies of the information should be made available to the Ministry including plans, drawings and appendices.

(a) Body of the Report

The body of the report should contain the following information:

(i) a brief description of the acoustic environment at the site, listing all significant existing or proposed sound sources, their location and characteristics;

4. Required Information

The extent of sound monitoring or prediction of sound levels should be discussed with the Ministry at an early stage of planning. The following represents the information which should then be provided for relevant points of reception for the project under study:

1. Acoustical Characteristics of Existing and Potential Sound Sources External to the Planned Land Use

   (a) where sound from a source is steady, the sound level in A-weighted decibels (dBA);

   (b) where the sound level is varying, the equivalent sound level (L_{eq}), the 50th percentile sound level (L_{50}), and, if available, the applicable histogram and the cumulative distribution of sound for the period of observation;

   (c) such other specialized sound descriptors and sound levels, as may be necessary to describe existing or predicted conditions; and

   (d) description of the sound source with particular reference to tonal and impulsive characteristics and directivity pattern.

   (e) where sound sources are enclosed or shielded by barriers, the locations, dimensions, and structural details should be provided;

   (f) special consideration should be given to planned blasting operations. The expected peak pressure level (dB linear peak) and peak particle velocity (cm/s) should be indicated at points of reception;

   (g) prevailing wind conditions.

2 Acoustic Environment at Site

   (a) site plan indicating property boundaries and location and elevation of the various structures and objects on the site;

   (b) physical and topographical description of the area;

   (c) area location plan indicating the nature of the neighbourhood around the site including roads up to at least 500 m distance from the site property line, location and heights of all buildings or other structures within this distance and the location and elevation of sources of sound.

Publication NPC-134

Guidelines on Information Required for the Assessment of Planned New Land Uses With Respect to Sound and Vibration Impacts

1. Scope

This Publication refers to information required for the assessment of planned new land uses with respect to sound and vibration impacts, in compliance with provisions of The Planning Act, The Environmental Assessment Act and other relevant legislation. These guidelines apply to changes of Official Plans, rezoning, applications for subdivision approval and all new land uses adjacent to major transportation and energy corridors, industries and airports.

2. Technical Definitions

The technical terms used in this Publication are defined in Publication NPC-101 - Technical Definitions.

3. Measurement Standards and Procedures

For the purposes of this Publication:

(1) all measurements shall be made in accordance with Publication NPC-103 - Procedures, and where appropriate, the following Publications should be consulted,

(i) Publication NPC-131 - Guidelines for Noise Control in Land-Use Planning,

(ii) Publication NPC-132 - Guidelines for Noise Control in Rural Areas,

(iii) Publication NPC-133 - Guidelines on Information Required for the Assessment of Planned Stationary Sources of Sound, and

(iv) Publication NPC-106 - Sound Levels of Road Traffic.

(2) the site shall be designed so as to assure compliance with the sound level limits listed in either,

(i) Publication NPC-131 - Guidelines for Noise Control in Land-Use Planning in all cases where the predominant sound is industry or a highway producing near constant sound levels throughout the observation period,

or optionally,

(ii) the applicable Central Mortgage and Housing Corporation publications on housing construction standards if the predominant sound is varying.

(a) Body of the Report

The body of the report should contain the following information:

(i) a brief description of the acoustic environment the site, listing all significant existing or proposed sound sources, their location and characteristics;

(ii) sound levels at the site due to individual sources, preferably summarized in a Table;

(iii) combined sound levels at the site due to individual sound sources, preferably tabulated for representative locations;

(iv) a comparison between the projected sound levels on the site and the applicable standard;

(v) the excess sound level above the applicable standard should be tabulated, if any;

(vi) the location, nature and dimensions of noise attenuating structures or other noise control measures required to eliminate any excess over the applicable standard;

(vii) if the report is in the form of a feasibility study leading to conditional approval of a project, it would suffice to indicate the location and the nature of outdoor and indoor sound sources and control measures.

(b) Appendices to the Report

The following information should be provided as appendices to the main body of the report:

1. projected data for all items of equipment,
2. projected data for train and highway traffic and growth due to airports and industry. Sources of data should be provided;
3. details of sound level measurements and equipment used; and
4. calculations used in predicting sound levels, barrier height and other acoustical aspects of the report.

9. Transmittal of Information

Reports prepared for submission to the approving authority or a municipality are normally circulated in the Ministry. Technical assistance in preparing a report may be obtained from the Noise Pollution Control Section of the Pollution Control Branch of the Ministry.

6. Assessment of Potential Noise Impact for Large Installations

(1) Large manufacturing and/or process plants or industrial complexes where a multitude of sources exist require elaborate analysis. The assessment of impact of such projects requires extensive sound level mapping in addition to information specified in Section 5. Since zoning changes can usually be expected to follow the establishment of such industrial complexes a complete on-going record of the relevant sound level contours of the area becomes an essential reference in the submission process and a complete program of sound level monitoring should be submitted by the proponent.

(2) The present level of road and rail traffic in the vicinity of the proposed installation should be stated and the increase in such traffic due to the plant's operation should be projected forward for a period of at least ten years.

7. Approval of Abatement Programs

Abatement measures planned to alleviate an existing noise problem are also subject to approval. The following information is required in a submission:

1. the specification of abatement equipment and materials such as, transmission loss, insertion loss and noise reduction;
2. if the devices are standard catalogue items, indicate the model and manufacturer's name;
3. all necessary supporting calculations;
4. if alternative measures for noise abatement are proposed, a full description of such alternatives, such as administrative steps, changes in operational procedure or structural alterations, should be provided.

8. Report Format

Information provided in a report should conform to the following general format. Analysis and evaluation by the Ministry will consist of checking the validity of the information based on the best available technology. Observance of the required format may expedite approval by the Ministry.

(1) Planning Objectives

The scope of the information provided should be predicated on, and include a statement of the planning objectives of the municipality and a statement of the planning objectives of the approving authority, if other than the municipality.

(2) Organization of the Report

The information should be presented in a concise, itemized form with appropriate headings. Sufficient copies of the information should be made available to the Ministry including plans, drawings and appendices.

(i) octave or 1/3 octave sound pressure levels generated by the sources including measurement conditions, procedure and location of measurement points; and

at relevant locations at the source property line and at critical points of reception the predicted,

(j) hourly equivalent sound level (L_{eq}) of the source;

(k) Logarithmic Mean Impulse Sound Level (L_{LM}) of the source;

(l) hourly ninetieth percentile sound level (L_{90}) of the source, if the source is in a rural area;

(m) sound level using other specialized descriptors.

(2) Acoustic Environment

(a) existing hourly ninetieth percentile sound level (L_{90}) at points of reception if the source is in a rural area;

(b) existing hourly equivalent sound level (L_{eq}) of road traffic;

(c) plot plan of the source indicating location and elevation of noise emission points, property boundaries, as well as location and elevation of the various intervening structures and objects;

(d) physical and topographical description of the grounds;

(e) area location plan indicating the nature of the neighbourhood around the source, including roads up to at least 500 m distance from the property line, location and heights of all buildings or other intervening structures within this distance. Where a large installation or industrial complex such as an oil refinery, steel mill, generating station or mine site, etc., is proposed, the area plan or map should show current as well as projected land use within a distance of approximately 1 kilometre from the property line;

(f) prevailing wind conditions.

(3) Abatement Features

Where sound sources are silenced, enclosed or shielded by barriers the location, dimensions, structural details and material used.

(4) Consideration for Air Blast (Concussion) and Vibration

Special consideration should be given in the submission to blasting causing concussion or ground vibration. The expected peak pressure level (dB linear peak) and peak particle velocity (cm/s) should be indicated at points of reception.

(5) Calculation Procedures

Details of methods, mathematical models used and assumptions made in deriving sound levels at relevant points of reception.

(2) Rural Areas

For a source in a rural area as defined in Publication NPC-132 - Guidelines for Noise Control in Rural Areas, where the existing sound environment is determined largely by natural sounds, and where road traffic, if any, is not frequent, the sound level due to the source should be shown not to exceed the existing background sound level at any point of reception within 30 m of a dwelling or a camping area. The following specific sound level limits apply:

(a) for impulsive sound from the source, with the exception of Quasi-Steady Impulsive Sound, the predicted Logarithmic Mean Impulse Sound Level (L_{LM}) should not, in any hour of the day, exceed the higher of:

(i) the one hour ninetieth percentile sound level (L_{90}) of natural sound plus 15 dB, or

(ii) 50 dBAI.

(b) for all other types of sound from the source, including Quasi-Steady Impulsive Sounds, the predicted one hour equivalent sound level (L_{eq}) of sound from the source should not, in any hour of the day, exceed the existing one hour ninetieth percentile sound level (L_{90}) of natural sounds by more than 10 dB. The predicted one hour ninetieth percentile sound level (L_{90}) of sound from the source should also not, in any hour of the day, exceed the existing one hour ninetieth percentile sound level (L_{90}) of natural sounds by more than 5 dB.

5. Required Information

The following represents the information which should be provided:

(1) Acoustical Characteristics of Sound Sources

(a) relevant equipment specification, including model, manufacturer's name and all necessary supporting data or calculations;

(b) sequence of operation of multiple, intermittent sources;

(c) time varying characteristics of generated sound (steady or intermittent);

(d) tonal characteristics;

(e) impulsive characteristics;

(f) directivity pattern of proposed source;

(g) noise measurement techniques and equipment used for evaluation of source emission; and

(h) octave or 1/3 octave sound power levels for the sources where available; or

Publication NPC-133

Guidelines on Information Required for the
Assessment of Planned Stationary Sources of Sound

1. Scope

This Publication refers to information required for the assessment of planned stationary sources of sound, in compliance with section 8 of The Environmental Protection Act or for purposes of The Environmental Assessment Act. The guidelines apply to new sources of sound as well as expansion, alteration or conversion of existing sources.

2. Technical Definitions

The technical terms used in this Publication are defined in Publication NPC-101 - Technical Definitions.

3. Measurement Standards and Procedures

For the purpose of this Publication:

(1) all measurements shall be made in accordance with Publication NPC-103 - Procedures, and where appropriate, Publication NPC-132 - Guidelines for Noise Control in Rural Areas;

(2) traffic noise shall be determined in accordance with Publication NPC-106 - Sound Levels of Road Traffic.

4. Sound Level Limits

(1) Urban Areas

For a source in a developed area, where the existing sound environment is determined largely by the activities of man, the sound level due to the source should be shown to not exceed the existing sound level resulting from industrial activity and road traffic at a point of reception in a residential or recreational area. In particular:

(a) for impulsive sound from the source, with the exception of Quasi-Steady Impulsive Sound, the predicted Logarithmic Mean Impulse Sound Level (L_{LM}), of sound from the source at a point of reception, should not, in any hour of the day, exceed the larger of 50 dBAI or the combined one hour equivalent sound level (L_{eq}) of existing industry and existing road traffic, measured together as if they constituted a stationary source;

(b) for all other types of sound from the source including Quasi-Steady Impulsive Sounds, the predicted one hour equivalent sound level (L_{eq}) of sound from the source at a point of reception, should not, in any hour of the day, exceed the one hour equivalent sound level (L_{eq}) of existing industry and existing road traffic measured together as if they constituted a stationary source.

5. Sound Level Limits

In a rural area, within 30 m of a dwelling or a camping area, in any hour, the ninetieth percentile sound level (L_{90}) of a stationary source should not exceed the ninetieth percentile sound level (L_{90}) of the natural environment, by more than 5 dB.

6. Sound Level Limits - Impulsive Sound

In a rural area, within 30 m of a dwelling or a camping area, in any hour, the Logarithmic Mean Impulse Sound Level (L_{LM}), as determined in accordance with Publication NPC-103 - Procedures section 3, for sound from a stationary source, should not exceed the higher of:

(i) the ninetieth percentile sound level (L_{90}) of natural sound plus 15 dB, or

(ii) 50 dBAI.

7. Sound Level Limits - Impulsive Sounds

In a rural area, within 30 m of a dwelling or a camping area, the impulse sound level from a stationary source which is not a planned blasting operation in a mine, quarry or construction should not exceed 100 dBAI.

8. Exclusion

No restrictions should apply to any stationary source resulting in an equivalent sound level (L_{eq}) or ninetieth percentile sound level (L_{90}) of 40 dBA or less within 30 m of a dwelling or a camping area.

9. Planning For Control of New Stationary Sources

Proponents of new or expanding projects having a potential noise impact in rural areas should obtain prior approval for the project in accordance with section 8 of The Environmental Protection Act. Publication NPC-133 - Guidelines on Information Required for the Assessment of Planned Stationary Sources of Sound provides information for making submissions.

Publication NPC-132

Guidelines for Noise Control in Rural Areas

1. Scope

This Publication suggests sound level limits for stationary sources in rural areas where the acoustical environment is normally dominated by natural sounds and where road traffic, if any, is not frequent.

2. Definitions

(1) Technical Definitions

The technical terms used in this Publication are defined in Publication NPC-101 - Technical Definitions.

(2) Definitions Specific to this Publication

A "rural area" is an area with little or no road traffic such as the following:

(i) a small community with less than 1000 population;

(ii) farm land or land zoned rural or agricultural;

(iii) a rural recreational area such as a cottage or resort area; or

(iv) a wilderness area.

3. Measurement Standards and Procedures

(1) For the purposes of this Publication all measurements of equivalent sound level (L_{eq}) shall be made in accordance with Publication NPC-103 - Procedures;

(2) Measurement of the ninetieth percentile sound level (L_{90}) may be made during any one hour using instrumentation providing percentile sound levels or by a manual method using a General Purpose Sound Level Meter. In the manual method, three independent measurements shall be taken, each of which shall be the lowest slow response reading of the meter during a continuous period of at least 1 minute. The arithmetic mean of the three measurements shall be considered to be the ninetieth percentile sound level (L_{90}) of that hour.

4. Sound Level Limits

In a rural area, within 30 m of a dwelling or a camping area, in any hour, the equivalent sound level (L_{eq}) of a stationary source should not exceed the ninetieth percentile sound level (L_{90}) of the natural environment, by more than 10 dB.

(3) Where the requirements of Table 131-3 cannot be met, special architectural design and construction features will have to be incorporated into the building to ensure compliance with the appropriate requirements of Table 131-1.

5. Planning the Project

(1) Responsibility of Developer

The developer or proponent of a new project, or project to convert an existing use, for a residential or sound-sensitive development in an urban area, should be responsible for investigating both the outdoor and potential indoor acoustical environments, and to determine the feasibility and the constraints applicable before any project action is taken or construction commitment made.

(2) Establishing the Sound Levels On-Site

The sound levels anticipated on the site should be established by the use of prediction techniques acceptable to the Minister, based when necessary on actual measurements. In all cases, consideration should be given to anticipated future increases in sound levels for at least ten years.

(3) Control Measures

When anticipated sound levels on the site of the land-use development under consideration exceed the recommended sound level limits, the land developer should institute appropriate control measures or revision to plans.

(4) Ventilation

Air conditioning or forced air ventilation systems should be provided when special architectural design or construction features used as control measures restrict indoor ventilation.

Table 131-1
Indoor Sound Level Limits

Type of Space	Equivalent Sound Level (L_{eq}), dBA
Bedrooms, sleeping quarters, hospitals, etc. (Time period 23 00 - 07 00)	40
Living rooms, hotels, motels, etc. (Time period 07 00 - 23 00)	45
Individual or semi-private offices, small conference rooms, reading rooms, classrooms, etc. (Time period 07 00 - 23 00)	45
General offices, reception areas, retail shops and stores, etc. (Time period 07 00 - 23 00)	50

Table 131-2
Sound Level Limits for Outdoor
Recreational Areas (07 00 - 23 00)

Sound Descriptor for the Entire Period	Sound Level Limit, dBA
L_{50}	52
L_{eq}	55

Table 131-3
Sound Level Limits for Outdoor
Areas (23 00 - 07 00)

Sound Descriptor for the Entire Period	Sound Level Limit, dBA
L_{50}	47
L_{eq}	50

(iii) Architectural Design - room and corridor arrangement, blank walls, placement of windows, balconies and courtyards, building height;

(iv) Construction - acoustical treatment of walls, ceilings, windows and doors, selection of acoustical materials and other control devices.

3. Indoor Sound Level Limits

(1) Table 131-1 as adjusted in accordance with subsection (2), if necessary, gives the equivalent sound level (L_{eq}) limits and the applicable time periods for the indicated types of indoor space. These are the minimum requirements of these Guidelines and apply in all cases.

(2) When the predominant sound has pronounced tonal quality such as a whine, screech, buzz, or hum or contains pronounced narrow bands of energy, then 5 dB should be deducted from the sound level limits indicated in Table 131-1.

4. Outdoor Sound Level Limits

(1) Table 131-2 gives the sound level limits for two descriptors,

the 50th percentile sound level (L_{50}) and

the equivalent sound level (L_{eq})

for outdoor recreational areas, where the descriptors are referenced to the entire 16 hour period from 07 00 to 23 00. The 50th percentile sound level need only be considered for development where the predominant sound is industry or a highway producing near constant sound levels throughout the 16 hour period. Compliance with these sound level limits should generally ensure compliance with the appropriate requirements of Table 131-1 for the same time period for any normal building construction nearby.

(2) Table 131-3 gives the sound level limits for two descriptors,

the 50th percentile sound level (L_{50}) and

the equivalent sound level (L_{eq}),

for outdoor areas, in the vicinity of buildings or proposed buildings containing sleeping quarters, where the descriptors are referenced to the entire 8 hour period from 23 00 to 07 00 The 50th percentile sound level need only be considered for development where the predominant sound is industry or a highway producing near constant sound levels throughout the 8 hour period. Compliance with these sound level limits should generally ensure compliance with the appropriate requirements of Table 131-1 for the same time period for any normal building construction nearby.

Publication NPC-131

Guidelines for Noise Control in Land-Use Planning

1. Scope

This Publication refers to the noise environment on the site of proposed residential or other sound-sensitive development in an urban area. Specified sound-level limits should apply to a new development as well as alteration to, or conversion of, any existing development or construction.

2. Definitions

(1) Technical Definitions

The technical terms used in this Publication are defined in Publication NPC-101 - Technical Definitions.

(2) Definitions Specific to this Publication

(a) Outdoor Recreational Areas

"Outdoor recreational areas" refers to those outdoor amenity areas where the enjoyment of the outdoor environment is important. These amenity areas include, but are not limited to, the following:

(i) yards including front yards, backyards, gardens, terraces or patios of dwellings;

(ii) common outdoor areas allocated for recreational purposes such as areas outside apartment buildings, condominiums, group homes, hospitals and schools;

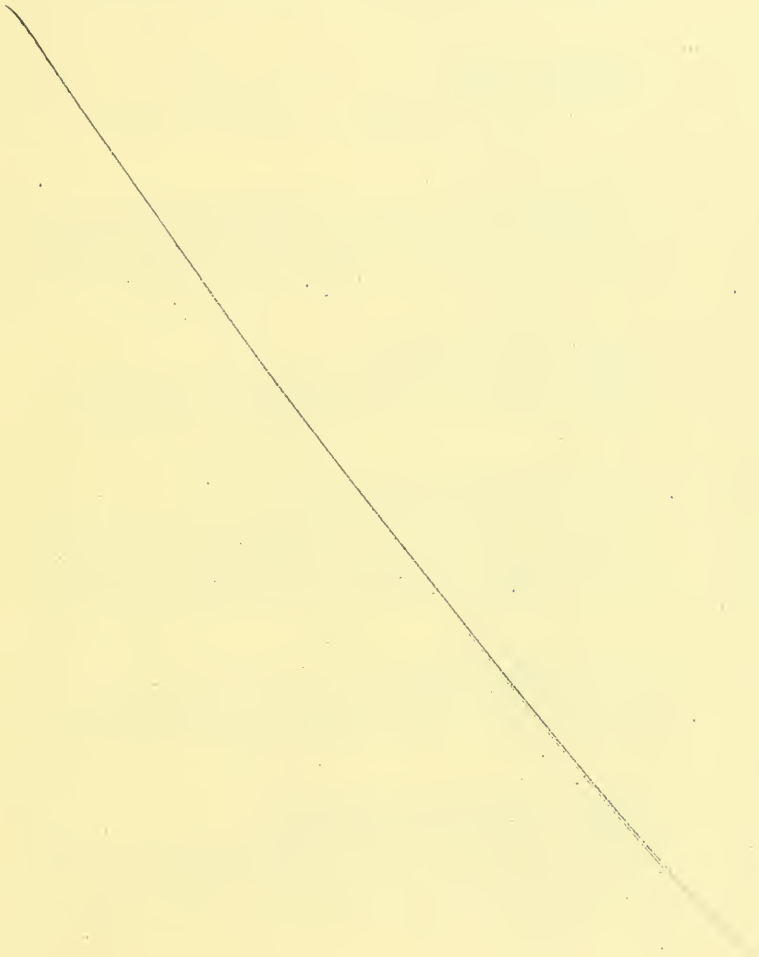
(iii) parks and open spaces allocated for recreational purposes within a plan of subdivision.

(b) Control Measures

"Control measures" refers to actions which can be taken to achieve noise compatibility for the specific land use or activity. Control measures may include, but are not limited to, the following:

(i) Site Planning - orientation of buildings and outdoor recreational areas with respect to noise sources, spatial separation such as insertion of sound-insensitive land uses between source and receiver and appropriate setbacks;

(ii) Acoustical Barriers - berms, walls, favourable topographical features, other intervening structures;



Publication NPC-119

Blasting

1. Scope

This Publication refers to limits on sound (concussion) and vibration due to blasting operations.

2. Technical Definitions

The technical terms used in this Publication are defined in Publication NPC-101 - Technical Definitions.

3. Measurement Procedures

All measurements of peak pressure level and vibration velocity shall be made in accordance with the "Procedure for Measurement of Sound and Vibration due to Blasting Operations" set out in Publication NPC-103 - Procedures, section 5.

4. Concussion - Cautionary Limit

Subject to section 5 the peak pressure level limit for concussion resulting from blasting operations in a mine or quarry is 120 dB.

5. Concussion - Peak Pressure Level Limit

If the person in charge of a blasting operation carries out routine monitoring of the peak pressure level, the peak pressure level limit for concussion resulting from blasting operations in a mine or quarry is 128 dB.

6. Vibration - Cautionary Limit

Subject to section 7, the peak particle velocity limit for vibration resulting from blasting operations in a mine or quarry is 1.00 cm/s.

7. Vibration - Peak Particle Velocity Limit

If the person in charge of a blasting operation carries out routine monitoring of the vibration the peak particle velocity limit for vibration resulting from blasting operations in a mine or quarry is 1.25 cm/s.

Publication NPC-119

Blasting

1. Scope

This Publication refers to limits on sound (concussion) and vibration due to blasting operations.

2. Technical Definitions

The technical terms used in this Publication are defined in Publication NPC-101 - Technical Definitions.

3. Measurement Procedures

All measurements of peak pressure level and vibration velocity shall be made in accordance with the "Procedure for Measurement of Sound and Vibration due to Blasting Operations" set out in Publication NPC-103 - Procedures, section 5.

4. Concussion - Cautionary Limit

Subject to section 5 the peak pressure level limit for concussion resulting from blasting operations in a mine or quarry is 120 dB.

5. Concussion - Peak Pressure Level Limit

If the person in charge of a blasting operation carries out routine monitoring of the peak pressure level, the peak pressure level limit for concussion resulting from blasting operations in a mine or quarry is 128 dB.

6. Vibration - Cautionary Limit

Subject to section 7, the peak particle velocity limit for vibration resulting from blasting operations in a mine or quarry is 1.00 cm/s.

7. Vibration - Peak Particle Velocity Limit

If the person in charge of a blasting operation carries out routine monitoring of the vibration the peak particle velocity limit for vibration resulting from blasting operations in a mine or quarry is 1.25 cm/s.

Publication NPC-118

Motorized Conveyances

1. Scope

This Publication sets sound emission standards for motorized conveyances of various types.

2. Technical Definitions

(1) The technical terms used in this Publication are defined in Publication NPC-101 - Technical Definitions.

(2) Definitions Specific to this Publication

Heavy Vehicle

"Heavy vehicle" means a motorized conveyance having a registered gross weight of more than 4,500 kg.

3. Sound Emission Standards - Governed Diesel Engines

Table 118-1 lists for various years of manufacture, the sound emission standard for a heavy vehicle powered by a governed diesel engine when measured in accordance with the procedure set out in the Table.

TABLE 118-1

Sound Emission Standards for Heavy Vehicles with Governed Diesel Engines

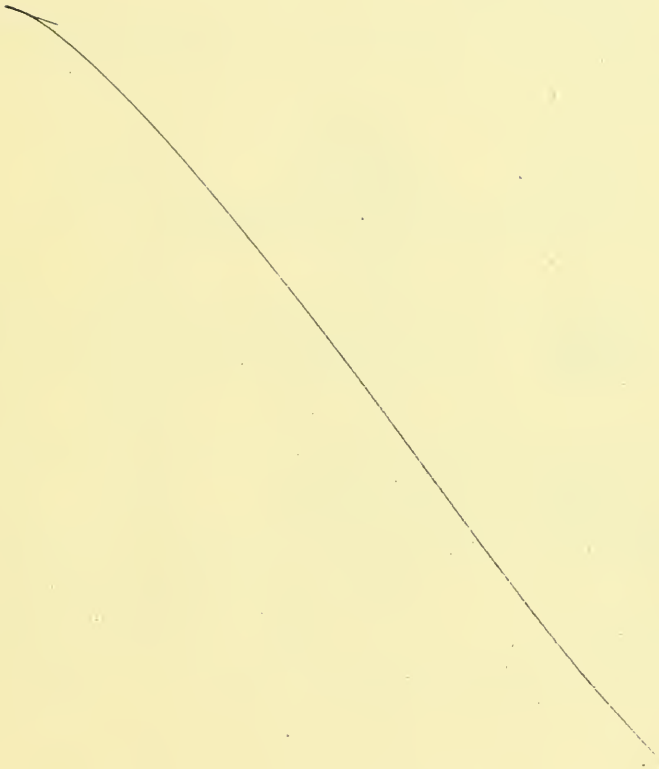
Date of Manufacture	Maximum Sound Level as Measured Using Publication NPC-103 - Procedures, section 9
Prior to Jan. 1, 1979	100
Jan. 1, 1979 and after	95

4. Sound Emission Standards - Gasoline Engines

Table 118-2 lists for various years of manufacture, the sound emission standard for a heavy vehicle powered by an ungoverned gasoline engine, when measured in accordance with the procedure set out in the Table.

TABLE 118-2

UNDER PREPARATION



Publication NPC-117

Domestic Outdoor Power Tools

1. Scope

This Publication sets sound emission standards for various domestic outdoor power tools.

2. Technical Definitions

The technical terms used in this Publication are defined in Publication NPC-101 - Technical Definitions.

3. Sound Emission Standards

Table 117-1 lists sound emission standards for walk-behind powered lawn mowers measured according to the procedure indicated in the Table.

TABLE 117-1

Sound Emission Standards for Walk-Behind Powered Lawn Mowers

Date of Manufacture	Maximum Sound Level as Measured using Publication NPC-103 - Procedures section 8 dBA
Jan. 1, 1979 to Dec. 31, 1980	73
Jan. 1, 1981 and after	69

4. Sound Emission Standards

Table 116-2 lists the sound emission standards for new residential air conditioning devices, including heat pumps, measured in accordance with the procedures indicated in the Table.

TABLE 116-2

SOUND EMISSION STANDARD

FOR

RESIDENTIAL CENTRAL AIR CONDITIONERS AND HEAT PUMPS

Date of Manufacture	Size (BTUH)	Maximum ARI Standard Sound Rating (bels)	Measurement Procedure
After 1990-12-31 and Before 1992-01-01	< 38900	8.0	ARI Standard 270 - 84
After 1991-12-31 and Before 1995-01-01	< 38900	7.6	
After 1994-12-31	< 38900	(under discussion with the industry to assess the feasibility of reduction.)	

ARI = Air-Conditioning and Refrigeration Institute.

BTUH = British Thermal Unit for an Hour.

Publication NPC-116

Residential Air Conditioners

1. Scope

This Publication sets sound level limits and sound emission standards for residential air conditioning devices.

2. Technical Definitions

The technical terms used in this Publication are defined in Publication NPC-101 - Technical Definitions.

3. Sound Level Limits

Table 116-1 lists the sound level limits for residential air conditioning devices, where the sound level is measured in accordance with the procedure set out in the Table.

TABLE 116-1
Sound Level Limits

Central Air Conditioning Devices		
Date of Installation	L_{eq} (dBA)	Measurement Procedure
Before Jan. 1, 1980	50	NPC-103 - Section 3 Procedure for Measurement of Steady or Impulsive Sound
Jan. 1, 1980 and after	45	
Window or Through-the-Wall Air Conditioning Devices		
Date of Installation	L_{eq}(dBA)	Measurement Procedure
Jan. 1, 1978 and after	50	NPC-103 - Section 3 Procedure for Measurement of Steady or Impulsive Sound

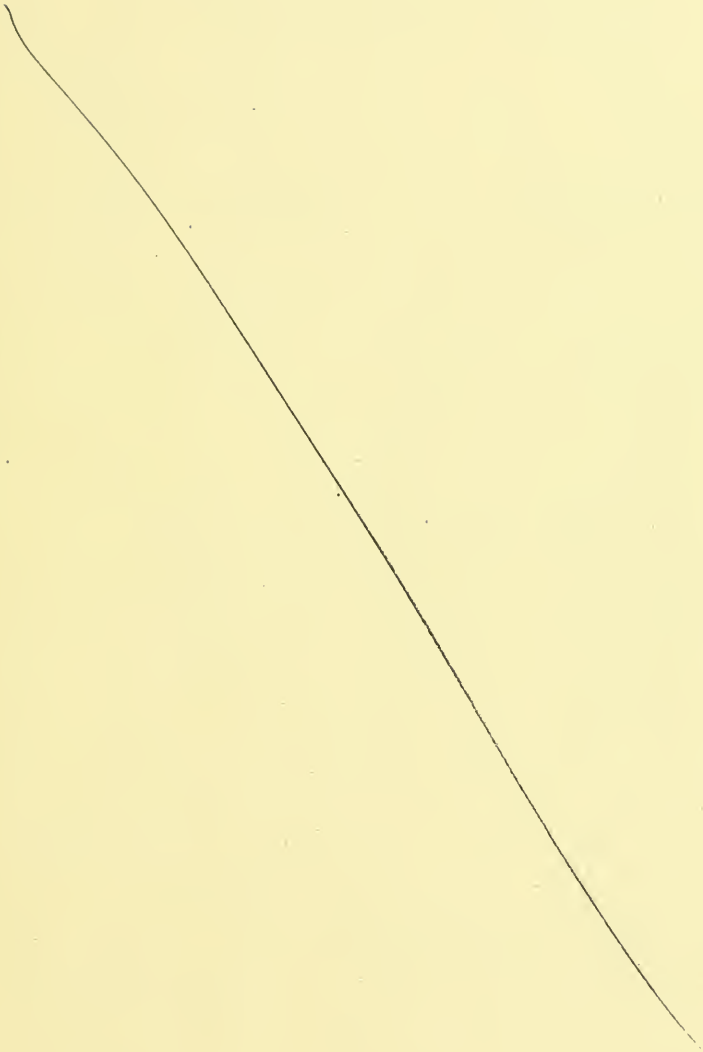


TABLE 115-4

Sound Emission Standard for Tracked Drills

Standard	Date of Manufacture	Maximum Sound Level as measured using Publication NPC-103 - Procedures, section 6. dBA
Quiet Zone and Residential Area Sound Emission Standard	Jan. 1, 1981 and after	100

TABLE 115-2

Sound Emission Standards for Pneumatic Pavement Breakers

Standard	Date of Manufacture	Maximum Sound Level as measured using Publication NPC-103 - Procedures, section 7 dBA
Quiet Zone Sound Emission Standard	Jan. 1, 1979 and after	85
Residential Area Sound Emission Standard	Jan. 1, 1979 to Dec. 31 1980	90
	Jan. 1, 1981 and after	85

TABLE 115-3

Sound Emission Standards for Portable Air Compressors

Standard	Date of Manufacture	Maximum Sound Level as measured using Publication NPC-103 - Procedures, section 7 dBA
Quiet Zone Sound Emission Standard	Jan. 1, 1979 to Dec. 31, 1980	76
	Jan. 1, 1981 and after	70
Residential Area Sound Emission Standard	Jan. 1, 1979 and after	76

Publication NPC-115

Construction Equipment

1. Scope

This Publication sets sound emission standards for various items of new construction equipment according to the date of manufacture of the equipment.

2. Technical Definitions

The technical terms used in this Publication are defined in Publication NPC-101 - Technical Definitions.

3. Sound Emission Standards

Tables 115-1 to 115-4 inclusive list Residential Area sound emission standards and Quiet Zone sound emission standards for specific items of new construction equipment measured in accordance with the procedures indicated.

TABLE 115-1

Quiet Zone and Residential Area Sound Emission Standards for Excavation Equipment, Dozers, Loaders, Backhoes or Other Equipment Capable of Being Used for Similar Application

Maximum Sound Level as determined using Publication NPC-103 - Procedures, section 6 dBA		
Date of Manufacture	Power Rating Less than 75 kW	Power Rating 75 kW and larger
January 1, 1979 to December 31, 1980	85	88
January 1, 1981 and after	83	85

TABLE 106-11

Effective Source Height (metres) for Road Traffic

Percentage of Vehicles Larger than Vans or Pick-ups:	Speed Limit km/h			
	50	65	80	90 or greater
	Source Height (m)			
up to 0.5	0.3	0.3	0.3	0.3
0.6 to 1.5	1.2	1.0	0.6	0.6
1.6 to 3.0	1.5	1.2	1.0	1.0
3.1 to 6.0	1.8	1.5	1.2	1.0
7 to 12	2.1	1.8	1.2	1.2
13 to 24	2.4	1.8	1.5	1.2
25 or over	2.4	2.1	1.5	1.5

TABLE 106-10

Correction to be Added to (+) or Subtracted from (-) the Equivalent Sound Level (L_{eq}) For Distance from Centre Line of Road to Point of Reception and for Total Effective Height Above Ground

Total Effective Height (metres) Above Ground*	Horizontal Distance (metres) from Centre Line of Road to Point of Reception																	
	9	12	15	18	24	30	37	50	60	75	100	120	150	200	250	300	370	500
	REFLECTIVE SURFACES																	
ALL HEIGHTS	+5	+4	+3	+2	+1	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12
	OTHER SURFACES																	
54.1 and over	+5	+4	+3	+2	+1	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-11	-13	-15
43.1 - 54	+5	+4	+3	+2	+1	0	-1	-2	-3	-4	-5	-6	-7	-8	-10	-12	-14	-16
34.1 - 43	+5	+4	+3	+2	+1	0	-1	-2	-3	-4	-5	-6	-7	-9	-11	-13	-14	-17
27.1 - 34	+5	+4	+3	+2	+1	0	-1	-2	-3	-4	-5	-6	-8	-10	-12	-14	-16	-18
21.1 - 27	+5	+4	+3	+2	+1	0	-1	-2	-3	-4	-5	-7	-9	-11	-13	-15	-17	-19
17.1 - 21	+5	+4	+3	+2	+1	0	-1	-2	-3	-4	-6	-8	-10	-12	-14	-16	-18	-20
14.1 - 17	+5	+4	+3	+2	+1	0	-1	-2	-3	-5	-7	-9	-11	-13	-15	-17	-18	-20
11.1 - 14	+5	+4	+3	+2	+1	0	-1	-2	-4	-6	-8	-10	-12	-14	-16	-17	-19	-21
8.1 - 11	+5	+4	+3	+2	+1	0	-1	-3	-5	-7	-9	-11	-13	-15	-17	-18	-20	-21
7.1 - 8	+5	+4	+3	+2	+1	0	-2	-4	-6	-8	-10	-12	-14	-16	-17	-19	-20	-22
5.1 - 7	+5	+4	+3	+2	+1	-1	-3	-4	-7	-9	-11	-13	-14	-16	-18	-19	-20	-22
4.1 - 5	+5	+4	+3	+2	0	-2	-4	-6	-8	-10	-12	-14	-15	-17	-18	-20	-21	-23
2.1 - 4	+5	+4	+3	+1	0	-2	-4	-6	-9	-10	-12	-14	-16	-18	-19	-21	-22	-24
up to 2	+5	+4	+3	+1	-1	-3	-5	-7	-9	-11	-13	-15	-17	-19	-21	-22	-23	-25

*Total Effective Height is the sum of the Effective Source Height (from Table 106-11) and the height of the point of reception above the ground.

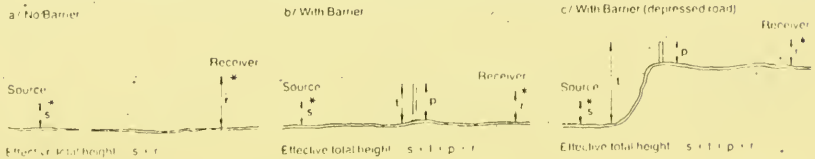


TABLE 106-8

Correction to be Added for Road Gradient (dB)

Given the road gradient and the percentage of vehicles larger than vans or pickups, this Table provides a correction to the predicted one hour equivalent sound level (L_{eq}) representing the increased load imposed on heavy vehicles by a road gradient. For any intermediate value of percentage road gradient not shown in the Table, the nearest value in the Table shall be used.

Percentage of Vehicles Larger than Vans or Pickups	Gradient				
	1%	2%	3%	4%	5%
	dB				
0 - 7	0	1	1	1	2
8 - 12	1	1	2	2	3
13 - 17	1	1	2	3	3
18 or over	1	2	3	3	4

TABLE 106-9

Correction to be Added for Interrupted Traffic Flow (dB)

Percentage of Vehicles Larger than Vans or Pickups	Distance (metres) Point of Reception to Nearest Point of Interrupted Traffic Flow			
	0 to 60	60.1 to 90	90.1 to 120	120.1 to 150
	dB			
0 - 10	2	1	1	1
11- 22	3	2	2	1
83 or over	4	3	2	1

TABLE 106-7

Given the traffic volume in vehicles per hour and the percentage of vehicles larger than vans or pickups, this Table provides the predicted one hour equivalent sound level at 30 m from the centre line of a road with a speed limit greater than 90 km/h. For values of traffic volume not shown in the Table, the nearest values in the Table shall be used.

L_{eq} at 30 m; Speed Limit above 90 km/h

	Percentage of Vehicles Larger than Vans or Pickups.													
Hourly Traffic Volume	up to 1.0	1.1 to 3.0	3.1 to 5.0	5.1 to 7.5	7.6 to 10	11 to 13	14 to 18	19 to 23	24 to 29	30 to 39	40 to 52	53 to 69	70 to 80	90 or over
40	56	56	57	57	58	58	59	59	60	61	62	63	64	64
50	57	57	58	58	59	59	60	60	61	62	63	64	65	65
63	58	58	59	59	60	60	61	61	62	63	64	65	66	66
80	59	59	60	60	61	61	62	62	63	64	65	66	67	67
100	60	60	61	61	62	62	63	63	64	65	66	67	68	68
125	61	61	62	62	63	63	64	64	65	66	67	68	69	69
160	62	62	63	63	64	64	65	65	66	67	68	69	70	70
200	63	63	64	64	65	65	66	66	67	68	69	70	71	71
250	64	64	65	65	66	66	67	67	68	69	70	71	72	72
315	65	65	66	66	67	67	68	68	69	70	71	72	73	73
400	66	66	67	67	68	68	69	69	70	71	72	73	74	74
500	67	67	68	68	69	69	70	70	71	72	73	74	75	75
630	68	68	69	69	70	70	71	71	72	73	74	75	76	76
800	69	69	70	70	71	71	72	72	73	74	75	76	77	77
1000	70	70	71	71	72	72	73	73	74	75	76	77	78	78
1250	71	71	72	72	73	73	74	74	75	76	77	78	79	79
1600	72	72	73	73	74	74	75	75	76	77	78	79	80	80
2000	73	73	74	74	75	75	76	76	77	78	79	80	81	81
2500	74	74	75	75	76	76	77	77	78	79	80	81	82	82
3150	75	75	76	76	77	77	78	78	79	80	81	82	83	83
4000	76	76	77	77	78	78	79	79	80	81	82	83	84	84
5000	77	77	78	78	79	79	80	80	81	82	83	84	85	85
6300	78	78	79	79	80	80	81	81	82	83	84	85	86	86
8000	79	79	80	80	81	81	82	82	83	84	85	86	87	87
10000	80	80	81	81	82	82	83	83	84	85	86	87	88	88

TABLE 10c-n

Given the traffic volume in vehicles per hour and the percentage of vehicles larger than vans or pickups, this Table provides the predicted one hour equivalent sound level at 30 m from the centre line of a road with a speed limit greater than 75 km/h and equal to or less than 90 km/h. For values of traffic volume not shown in the Table, the nearest value in the Table shall be used.

L_{eq} at 30 m; Speed Limit 75 - 90 km/h

	Percentage of Vehicles Larger than Vans or Pickups													
Hourly Traffic Volume	up to 1.0	1.1 to 3.0	3.1 to 5.0	5.1 to 7.5	7.6 to 10	11 to 13	14 to 18	19 to 23	24 to 29	30 to 39	40 to 52	53 to 69	70 to 80	90 or over
40	55	55	56	56	57	57	58	59	59	60	61	62	63	64
50	56	56	57	57	58	58	59	60	60	61	62	63	64	65
63	57	57	58	58	59	59	60	61	61	62	63	64	65	66
80	58	58	59	59	60	60	61	62	62	63	64	65	66	67
100	59	59	60	60	61	61	62	63	63	64	65	66	67	68
125	60	60	61	61	62	62	63	64	64	65	66	67	68	69
160	61	61	62	62	63	63	64	65	65	66	67	68	69	70
200	62	62	63	63	64	64	65	66	66	67	68	69	70	71
250	63	63	64	64	65	65	66	67	67	68	69	70	71	72
315	64	64	65	65	66	66	67	68	68	69	70	71	72	73
400	65	65	66	66	67	67	68	69	69	70	71	72	73	74
500	66	66	67	67	68	68	69	70	70	71	72	73	74	75
630	67	67	68	68	69	69	70	71	71	72	73	74	75	76
800	68	68	69	69	70	70	71	72	72	73	74	75	76	77
1000	69	69	70	70	71	71	72	73	73	74	75	76	77	78
1250	70	70	71	71	72	72	73	74	74	75	76	77	78	79
1600	71	71	72	72	73	73	74	75	75	76	77	78	79	80
2000	72	72	73	73	74	74	75	76	76	77	78	79	80	81
2500	73	73	74	74	75	75	76	77	77	78	79	80	81	82
3150	74	74	75	75	76	76	77	78	78	79	80	81	82	83
4000	75	75	76	76	77	77	78	79	79	80	81	82	83	84
5000	76	76	77	77	78	78	79	80	80	81	82	83	84	85
6300	77	77	78	78	79	79	80	81	81	82	83	84	85	86
8000	78	78	79	79	80	80	81	82	82	83	84	85	86	87
10000	79	79	80	80	81	81	82	83	83	84	85	86	87	88

TABLE 106-5

Given the traffic volume in vehicles per hour and the percentage of vehicles larger than vans or pickups, this Table provides the predicted one hour equivalent sound level at 30 m from the centre line of a road with a speed limit greater than 65 km/h and equal to or less than 75 km/h. For values of traffic volume not shown in the Table, the nearest value in the Table shall be used.

L_{eq} at 30 m; Speed Limit 65 - 75 km/h

	Percentage of Vehicles Larger than Vans or Pickups													
Hourly Traffic Volume	up to 1.0	1.1 to 3.0	3.1 to 5.0	5.1 to 7.5	7.6 to 10	11 to 13	14 to 18	19 to 23	24 to 29	30 to 39	40 to 52	53 to 69	70 to 80	90 or over
40	53	54	54	55	56	56	57	58	58	59	60	61	62	63
50	54	55	55	56	57	57	58	59	59	60	61	62	63	64
63	55	56	56	57	58	58	59	60	60	61	62	63	64	65
80	56	57	57	58	59	59	60	61	61	62	63	64	65	66
100	57	58	58	59	60	60	61	62	62	63	64	65	66	67
125	58	59	59	60	61	61	62	63	63	64	65	66	67	68
160	59	60	60	61	62	62	63	64	64	65	66	67	68	69
200	60	61	61	62	63	63	64	65	65	66	67	68	69	70
250	61	62	62	63	64	64	65	66	66	67	68	69	70	71
315	62	63	63	64	65	65	66	67	67	68	69	70	71	72
400	63	64	64	65	66	66	67	68	68	69	70	71	72	73
500	64	65	65	66	67	67	68	69	69	70	71	72	73	74
630	65	66	66	67	68	68	69	70	70	71	72	73	74	75
800	66	67	67	68	69	69	70	71	71	72	73	74	75	76
1000	67	68	68	69	70	70	71	72	72	73	74	75	76	77
1250	68	69	69	70	71	71	72	73	73	74	75	76	77	78
1600	69	70	70	71	72	72	73	74	74	75	76	77	78	79
2000	70	71	71	72	73	73	74	75	75	76	77	78	79	80
2500	71	72	72	73	74	74	75	76	76	77	78	79	80	81
3150	72	73	73	74	75	75	76	77	77	78	79	80	81	82
4000	73	74	74	75	76	76	77	78	78	79	80	81	82	83
5000	74	75	75	76	77	77	78	79	79	80	81	82	83	84
6300	75	76	76	77	78	78	79	80	80	81	82	83	84	85
8000	76	77	77	78	79	79	80	81	81	82	83	84	85	86
10000	77	78	78	79	80	80	81	82	82	83	84	85	86	87

TABLE 106-4

Given the traffic volume in vehicles per hour and the percentage of vehicles larger than vans or pickups, this Table provides the predicted one hour equivalent sound level at 30 m from the centre line of a road with a speed limit greater than 50 km/h and equal to or less than 65 km/h. For values of traffic volume not shown in the Table, the nearest value in the Table shall be used.

L_{eq} at 30 m; Speed Limit 50 - 65 km/h

	Percentage of Vehicles Larger than Vans or Pickups													
Hourly Traffic Volume	up to 1.0	1.1 to 3.0	3.1 to 5.0	5.1 to 7.5	7.6 to 10	11 to 13	14 to 18	19 to 23	24 to 29	30 to 39	40 to 52	53 to 69	70 to 80	90 or over
40	51	52	53	54	55	55	56	57	58	59	60	61	62	63
50	52	53	54	55	56	56	57	58	59	60	61	62	63	64
63	53	54	55	56	57	57	58	59	60	61	62	63	64	65
80	54	55	56	57	58	58	59	60	61	62	63	64	65	66
100	55	56	57	58	59	59	60	61	62	63	64	65	66	67
125	56	57	58	59	60	60	61	62	63	64	65	66	67	68
160	57	58	59	60	61	61	62	63	64	65	66	67	68	69
200	58	59	60	61	62	62	63	64	65	66	67	68	69	70
250	59	60	61	62	63	63	64	65	66	67	68	69	70	71
315	60	61	62	63	64	64	65	66	67	68	69	70	71	72
400	61	62	63	64	65	65	66	67	68	69	70	71	72	73
500	62	63	64	65	66	66	67	68	69	70	71	72	73	74
630	63	64	65	66	67	67	68	69	70	71	72	73	74	75
800	64	65	66	67	68	68	69	70	71	72	73	74	75	76
1000	65	66	67	68	69	69	70	71	72	73	74	75	76	77
1250	66	67	68	69	70	70	71	72	73	74	75	76	77	78
1600	67	68	69	70	71	71	72	73	74	75	76	77	78	79
2000	68	69	70	71	72	72	73	74	75	76	77	78	79	80
2500	69	70	71	72	73	73	74	75	76	77	78	79	80	81
3150	70	71	72	73	74	74	75	76	77	78	79	80	81	82
4000	71	72	73	74	75	75	76	77	78	79	80	81	82	83
5000	72	73	74	75	76	76	77	78	79	80	81	82	83	84
6300	73	74	75	76	77	77	78	79	80	81	82	83	84	85
8000	74	75	76	77	78	78	79	80	81	82	83	84	85	86
10000	75	76	77	78	79	79	80	81	82	83	84	85	86	87

TABLE 106-3

Given the traffic volume in vehicles per hour and the percentage of vehicles larger than vans or pickups, this Table provides the predicted one hour equivalent sound level at 30 m from the centre line of a road with a speed limit greater than 35 km/h and equal to or less than 50 km/h. For values of traffic volume not shown in the Table, the nearest value in the Table shall be used.

L_{eq} at 30 m; Speed Limit 35 - 50 km/h

	Percentage of Vehicles Larger than Vans or Pickups													
Hourly Traffic Volume	up to 1.0	1.1 to 3.0	3.1 to 5.0	5.1 to 7.5	7.6 to 10	11 to 13	14 to 18	19 to 23	24 to 29	30 to 39	40 to 52	53 to 69	70 to 80	90 or over
40	49	50	51	52	53	54	55	56	57	58	59	60	61	62
50	50	51	52	53	54	55	56	57	58	59	60	61	62	63
63	51	52	53	54	55	56	57	58	59	60	61	62	63	64
80	52	53	54	55	56	57	58	59	60	61	62	63	64	65
100	53	54	55	56	57	58	59	60	61	62	63	64	65	66
125	54	55	56	57	58	59	60	61	62	63	64	65	66	67
160	55	56	57	58	59	60	61	62	63	64	65	66	67	68
200	56	57	58	59	60	61	62	63	64	65	66	67	68	69
250	57	58	59	60	61	62	63	64	65	66	67	68	69	70
315	58	59	60	61	62	63	64	65	66	67	68	69	70	71
400	59	60	61	62	63	64	65	66	67	68	69	70	71	72
500	60	61	62	63	64	65	66	67	68	69	70	71	72	73
630	61	62	63	64	65	66	67	68	69	70	71	72	73	74
800	62	63	64	65	66	67	68	69	70	71	72	73	74	75
1000	63	64	65	66	67	68	69	70	71	72	73	74	75	76
1250	64	65	66	67	68	69	70	71	72	73	74	75	76	77
1600	65	66	67	68	69	70	71	72	73	74	75	76	77	78
2000	66	67	68	69	70	71	72	73	74	75	76	77	78	79
2500	67	68	69	70	71	72	73	74	75	76	77	78	79	80
3150	68	69	70	71	72	73	74	75	76	77	78	79	80	81
4000	69	70	71	72	73	74	75	76	77	78	79	80	81	82
5000	70	71	72	73	74	75	76	77	78	79	80	81	82	83
6300	71	72	73	74	75	76	77	78	79	80	81	82	83	84
8000	72	73	74	75	76	77	78	79	80	81	82	83	84	85
10000	73	74	75	76	77	78	79	80	81	82	83	84	85	86

Adding and Subtracting Sound Levels

Difference between higher and lower measured sound levels	To obtain sum of two sound levels add this correction to measured higher value	Subtract this difference from combined sound level to obtain unknown component.
0	3.0	14.0
0.5	3.0	9.0
1.0	2.5	6.0
1.5	2.5	5.0
2.0	2.0	4.0
2.5	2.0	3.5
3.0	2.0	3.0
4.0	1.5	2.0
5.0	1.0	1.5
6.0	1.0	1.0
7.0	1.0	1.0
8.0	1.0	1.0
9.0	0.5	0.5
10.0	0	0.5
11.0	0	0.5
12.0	0	0.5
13.0 and up	0	0

TABLE 106-2

Minimum Value for Hourly L_{eq}

by Time of Day

Time of Day	L_{eq} (dBA)
07 00 - 19 00	50
19 00 - 20 00	49
20 00 - 21 00	48
21 00 - 22 00	47
22 00 - 23 00	46
23 00 - 24 00	45
24 00 - 01 00	44
01 00 - 02 00	43
02 00 - 03 00	41
03 00 - 04 00	40
04 00 - 05 00	42
05 00 - 06 00	45
06 00 - 07 00	48

(4) Correction for Road Gradient

For road gradients of 1% or more, add the correction indicated in Table 106-8 to the equivalent sound level (L_{eq}).

(5) Correction for Interrupted Traffic Flow

For a point of reception within 150 m of a traffic light, stop sign, or other interruption in traffic flow, add a correction as indicated in Table 106-9 to the equivalent sound level (L_{eq}).

(6) Measurement of Distance

The distance of the point of reception from the centre of the road shall be measured along the shortest line joining the point of reception to the centre of the road.

(7) Correction for Distance

Table 106-10 shall be used to correct for distance and for the type of ground surface.

(i) Water, all pavements, ice, hard packed gravel, earth and snow are sound reflective surfaces. If more than half of the ground surface between the centre line of the road and the point of reception is sound reflective, the distance correction shall be made using the section of the Table for reflective surfaces.

(ii) If less than half of the surface between the centre line of the road and the point of reception is sound reflective, the total effective height above the ground must be calculated by adding together the height of the point of reception above the ground and the effective source height for the road traffic obtained from Table 106-11. The correction for distance shall be made using the section of Table 106-9 for "other surfaces".

(8) Correction for Sheltering

If the point of reception is shielded from the road by solid barriers, buildings or a row of houses in such a manner that the total unobstructed angle of view of the road from the point of reception is less than 90^{o}, subtract 5 from the value obtained above.

(9) Correction for Grooving

Where the surface of the roadway is transversely grooved, this method of estimating the sound level due to road traffic should not be used.

(3) Estimation

In any other case, the equivalent sound level (L_{eq}) of the road traffic is estimated on the basis of traffic flows observed on the contributing roads during the period when the equivalent sound level (L_{eq}) of the source is measured. This estimation is made in accordance with sections 4 and 5. Where the surface of a contributing road is transversely grooved, this method of estimation should not be used.

4. Estimation of Sound Level Based on Traffic

The following procedure describes the manner in which the equivalent sound level of road traffic may be estimated on the basis of traffic flows observed during a period of time for which the equivalent sound level (L_{eq}) of the stationary source under investigation is measured. This method shall not be used when sound from road traffic reflected from a building of more than three stories in height, is clearly audible at the point of reception.

(1) For each road from which traffic is audible at the point of reception estimate the equivalent sound level (L_{eq}) at the point of reception using the method specified in section 5.

(2) Add the equivalent sound levels from each road using the decibel addition method in Table 106-1.

(3) Compare the resultant equivalent sound level (L_{eq}) with the Minimum Value for Hourly L_{eq} for the relevant hour listed in Table 106-2. The higher of the two values is the equivalent sound level (L_{eq}) of road traffic at the point of reception.

5. Road Noise Calculation

The following calculations shall be used to estimate the equivalent sound level (L_{eq}) produced at a point of reception by traffic on a road:

(1) Traffic Volume

Vehicles passing by on the road shall be counted for at least 20 minutes and the time interval of observation shall be noted. The traffic volume reported in vehicles per hour is the number of vehicles counted divided by the time interval as a fraction of an hour.

(2) Percentage Trucks

The percentage of vehicles larger than vans or pickups shall be calculated.

(3) Equivalent Sound Level at 30 m from Road Centre

Determination of the equivalent sound level at a point 30 m from the centre line of the road shall be made using Tables 106-3, -4, -5, -6 and -7. If the total width of a multi-lane road is less than 30 m then it shall be treated as one road. Wider roads shall be treated as two or more roads.

Publication NPC-106

Sound Levels of Road Traffic

1. Scope

This Publication describes methods to estimate the one hour equivalent sound level (L_{eq}) caused by sound from road traffic. It can be applied in any community where the acoustical environment is dominated by the sound, sometimes called "urban hum", of road traffic. Highly intrusive transportation noise such as aircraft and railway noise is excluded from the determination of this background noise.

2. Technical Definitions

The technical terms in this Publication are defined in Publication NPC-101 - Technical Definitions.

3. Road Traffic Noise Derivation

When measurement of the sound level of a stationary source is made, the equivalent sound level at the same point and the same time from road traffic shall be obtained using one of three methods, which are listed in order of preference, as follows:

(1) Measurement

The equivalent sound level of road traffic may be measured at the point of reception when the stationary source under investigation is not audible, within one hour of the period when sound from the stationary source was measured. The equivalent sound level (L_{eq}) of road traffic is obtained in accordance with Publication NPC-103 - Procedures, section 4.

(2) Measurement and Calculation

The equivalent sound level (L_{eq}) may be determined at the point of reception for any hour when the stationary source under investigation is operating and generating sound which, when it is present, does not vary in level over a range of more than 6 dB during the period of observation. The equivalent sound level (L_{eq}) of road traffic and the equivalent sound level (L_{eq}) of the source are obtained simultaneously using two sound level meters. One meter is used to measure the combined sound level of source and road traffic, as if it constituted a stationary source, in accordance with Publication NPC-103 - Procedures, section 4. The second meter is used to measure the sound level from the source only, in accordance with Publication NPC-103 - Procedures, section 4. Use of these procedures requires that operation of the second meter is inhibited at any time when the sound from the stationary source is dominated by any other sound, including the sound from road traffic. The equivalent sound level (L_{eq}) of road traffic is the unknown component of the combined sound level. This unknown component is the logarithmic difference between the combined sound level of source and road traffic and the sound level of the source alone. It may be obtained with the assistance of Table 106-1.

(2) For impulsive sound, other than Quasi-Steady Impulsive Sound, from a stationary source which is the discharge of firearms on the premises of a licensed gun club, if the sound level at a point of reception is expressed in terms of the Logarithmic Mean Impulse Sound Level (L_{LM}), the applicable sound level limit for that stationary source if it was in operation before January 1, 1980, is 70 dBAI, and otherwise is 50 dBAI.

(3) For impulsive sound, other than Quasi-Steady Impulsive Sound, from a stationary source, characterized by impulses which are so infrequent that they cannot normally be measured using the procedure mentioned in NPC-103 - Procedures, clause 3 (4)(f), if the sound level is expressed in terms of the impulse sound level, the applicable sound level limit is 100 dBAI.

6. Sound Level Limits - Pest Control Devices

(1) For impulsive sound, other than Quasi-Steady Impulsive Sound, from a pest control device employed solely to protect growing crops, if the sound level at a point of reception is expressed in terms of the Logarithmic Mean Impulse Sound Level (L_{LM}), the applicable sound level limit is 70 dBAI.

(2) For sound, including Quasi-Steady Impulsive Sound but not including other impulsive sound, from a pest control device employed solely to protect growing crops, if the sound level at a point of reception is expressed in terms of the one hour equivalent sound level (L_{eq}), the applicable sound level limit is 60 dBA.

(3) The operation of a pest control device outdoors is prohibited during the hours of darkness.

7. Preemption

(1) For impulsive sound, other than Quasi-Steady Impulsive Sound, if more than one sound level limit in sections 4, 5 and 6 is applicable, the least restrictive applicable sound level limit shall prevail.

(2) For sound, including Quasi-Steady Impulsive Sound but not including other impulsive sound, if more than one sound level limit in sections 4 and 6 is applicable, the less restrictive applicable sound level limit shall prevail.

8. Exclusion

No restrictions apply to a stationary source resulting in an equivalent sound level (L_{eq}) of 40 dBA or less at a point of reception.

Publication NPC-105

Stationary Sources

1. Scope

This Publication refers to sound level limits for sound from stationary sources.

2. Technical Definitions

The technical terms used in this Publication are defined in Publication NPC-101 - Technical Definitions.

3. Measurement Standards and Procedures

For the purposes of this Publication all measurements shall be made in accordance with Publication NPC-103 - Procedures.

4. Sound Level Limits - General

(1) For impulsive sound, other than Quasi-Steady Impulsive Sound, from a stationary source, if the sound level is expressed in terms of the Logarithmic Mean Impulse Sound Level (L_{LM}), the applicable sound level limit is the one hour equivalent sound level (L_{eq}) caused by road traffic as obtained pursuant to Publication NPC-106 - Sound Levels of Road Traffic, for that point of reception and the same time.

(2) For sound from a stationary source, including Quasi-Steady Impulsive Sound but not including other impulsive sound, if the sound level is expressed in terms of the one hour equivalent sound level (L_{eq}), the applicable sound level limit is the one hour equivalent sound level (L_{eq}) caused by road traffic as obtained pursuant to Publication NPC-106 - Sound Levels of Road Traffic, for that point of reception and the same time.

5. Sound Level Limits - Specific Impulsive Sounds

(1) For impulsive sound, other than Quasi-Steady Impulsive Sound, from a stationary source which is an industrial metal working operation (including but not limited to forging, hammering, punching, stamping, cutting, forming and moulding), if the sound level at a point of reception is expressed in terms of the Logarithmic Mean Impulse Sound Level (L_{LM}), the applicable sound level limit for that stationary source if it was in operation before January 1, 1980, is 60 dBAI, and otherwise is 50 dBAI.

TABLE 104-1

Adjustment for Intermittence

Duration of Sound In One Hour (Minutes)	Adjustment
40 - 60	0
20 - 39	3
10 - 19	6
5 - 9	9
3 - 4	12
1 - 2	15
less than 1	20

Publication NPC-104

Sound Level Adjustments

1. Scope

This Publication refers to the adjustment of a sound level obtained following the procedures set out in either section 3 or 4 of NPC-103 - Procedures.

2. Technical Definitions

The technical terms used in this Publication are defined in Publication NPC-101 - Technical Definitions.

3. Intermittence

If a sound is intermittent, the following adjustment shall be subtracted from the observed value:

$$\text{Adjustment} = 10 \log_{10} \frac{1}{x}$$

where x is the fraction of an hour for which the sound persists.

Such sound level adjustments are approximated in Table 104-1.

4. Adjustment for Special Quality of Sound

(1) Tonality

If a sound has a pronounced audible tonal quality such as a whine, screech, buzz, or hum then the observed value shall be increased by 5.

(2) Cyclic Variations

If a sound has an audible cyclic variation in sound level such as beating or other amplitude modulation then the observed value shall be increased by 5.

(3) Quasi-Steady Impulsive Sound

If a sound is Quasi-Steady Impulsive Sound then the observed value shall be increased by 10.

(4) One Adjustment Only

An adjustment may be made under one only of subsections (1), (2) and (3), providing that, if subsection (3) applies, it shall be used in preference to subsection (1) or subsection (2).